GAS

ENGINEERING • UTILIZATION • LOAD-BUILDING • MANAGEMENT

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IN the Gas Industry the name EMCO has, for over 50 years, been a symbol of ACCURACY, DEPENDABILITY, RELIABILITY in meters and regulators.

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We also support a meter fellowship at the world-renowned Mellon Institute, in Pittsburgh. Scientists here are constantly searching for better metering methods and materials. The results of such research become the exclusive property of the Pittsburgh Equitable Meter Company.

What's In A Name? In the name EMCO is embodied our guarantee of customer satisfaction and our determination to build products of only the highest quality.

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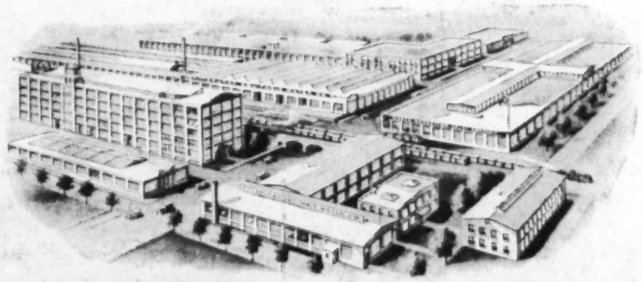
MAY 10 1939



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NOT SO LONG AGO the gas industry celebrated its Centenary as an American utility. At the same time a cast iron distribution main under the streets of Baltimore, began its one hundred-and-first year of continuous service. If equipped with today's mechanical joints, this pipe, cast in the long ago without benefit of modern metallurgical controls, would meet any modern operating requirement.

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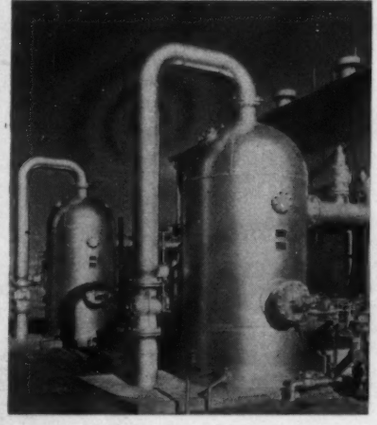

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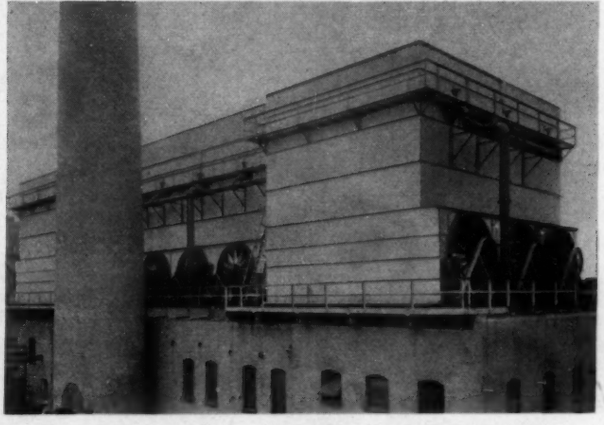

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GAS

Fifteenth Year of Publication

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Simplicity replaces the usual unwieldy design characteristic of this type of clamp. Fewer parts, especially in the larger sizes, facilitates and speeds up installation.

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The clamp is fashioned to the joint. Its roundness corresponds in detail to pipe circumference, assuring an even bearing completely around the spigot.

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The ease of application reduces installation cost to a minimum.

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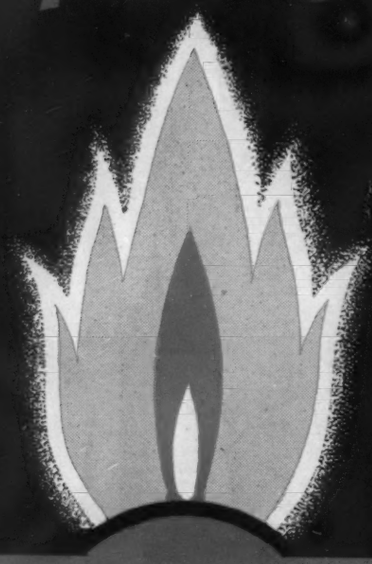

JUNE 1939

IN THIS ISSUE

We make our bow to one of America's fastest growing industries

★

"I am sure that such a magazine will be a constructive influence in the liquefied gas business, and as your plans mature we will be more than glad to keep in close touch with you and to offer such assistance as we can make available."

★

"We wish to be one of the first to go on record as heartily endorsing the publication you have in mind, and should like to be one of the first subscribers. If we may be of assistance to you in this connection, please feel free to call upon us at any time."

★

". . . Any announcement you have to make relative to such a magazine will be received with interest."

★

"I was very much interested to receive your letter announcing your contemplated monthly magazine to be devoted exclusively to our industry."

★

"We are very glad to hear that you expect to announce a new monthly magazine devoted exclusively to the Liquefied Petroleum Gas Industry."

★

"We know of no industry which is growing any faster at the present time than the liquefied petroleum gas business . . . We wish you good luck with the new magazine."

★

". . . I feel there is a need for a journal devoted to the liquefied petroleum gas industry and would be glad to see one published . . ."

★

". . . Our own folks, in twenty (20) states and Puerto Rico, at this time would unanimously welcome your proposed publication. Already Liquefied Gas people look to you for some items of interest concerning the industry in general. Your position in this respect is ideal, and no doubt you count it your good fortune . . ."

★

". . . Naturally, we would welcome any intelligently edited publication devoted to our industry. I am confident that it would serve to promote a general advancement in our service and merchandising . . ."

★

". . . This is very interesting news to this company and you will receive our 100 per cent support. I am sure that I speak for the rest of the underground liquefied petroleum gas companies in the southern district and trust that you will start this publication at an early date . . ."

★

"You may enter my name on your list as a subscriber, and if you will advise by return mail when we may expect the first issue and the subscription price, I may use this as a Christmas remembrance to several customers."

★

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The rapid developments in the Butane-Propane Industry make important news for the men engaged in this Industry and to those who supply its materials and equipment. For the past 10 years, our publication, *GAS*, has carried a regular monthly department devoted to Butane-Propane News. In addition, as publishers of the Handbook Butane-Propane Gases (7500 copies), we have been closely identified with this industry since 1932. As a result, we have been asked on many occasions why we did not publish a magazine devoted to Butane-Propane News exclusively. Our editorial plans have been completed and, beginning with the June issue, this fast-growing industry will have its own publication . . . BUTANE-PROPANE NEWS.

BUTANE-PROPANE NEWS will serve as a clearing house for information about all phases of the Industry, including Bottled Gas Distribution, Semi-Bulk Distribution, Dealer Sales and Service, New Appliances and Equipment, Town Plant Operation and Load-Building, Transportation and Storage, Safety Practices, Industrial and Standby Uses, Internal Combustion Engines, etc.

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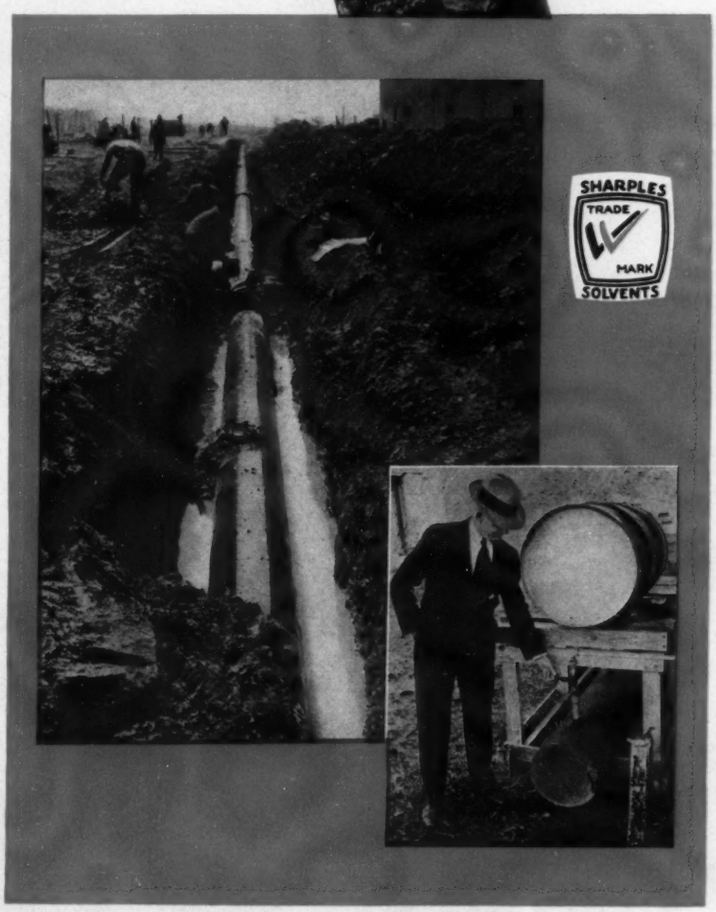
TIMELY WARNING-

Pentalarm YOUR PIPELINES!



THE WARNING ODOR FOR FUEL GASES

PENTALARM

The warning odor for fuel gases . . . PENTALARM . . . is the type of odorization you want, from a standpoint of simplicity, effectiveness and low cost of installation.

With PENTALARM on the job, the opening and closing of a single valve gives you perfectly controlled, uniform odorization. Introduction into the pipelines and mains is accomplished by the use of inexpensive equipment made up in your own shops (see illustration below). Safe odorization is secured at a cost of less than 1/10 of a cent per 1000 cu. ft. of gas, two 55-gallon drums being sufficient to odorize 1 Billion cu. ft. of gas!

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Pentalarm your pipelines . . .

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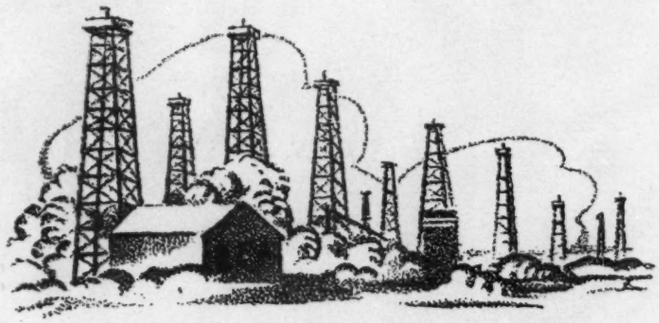

Merited Acceptance

The versatility, readiness, economy and cleanliness of Natural Gas have won a host of loyal friends for this Nature-endowed fuel. Research, testing and standardization have broadened materially the services which it can perform.

During the past thirty years the marketed production of Natural Gas in the United States has increased from 0.41 to 2.37 trillion cubic feet —nearly a six-fold expansion.

Adequate reserves, effective market development, economical operation, favorable technological aspects — are advantages contributing to the vitality of the natural gas business, making it an enduring instrument of human welfare.

Every employee in the gas industry represents an investment, for plant and equipment, of about $37,000, exceeding comparable investments in the automobile, steel and railroad businesses combined.

Approximately $5,000,000,000 of capital is required to provide service to more than 17,000,000 commercial, industrial and residential gas customers throughout the nation.

COLUMBIA SYSTEM

Columbia System, besides supplying Natural Gas to more than a million commercial, industrial and home consumers, serves in excess of 350,000 users of electric light, heat and power.

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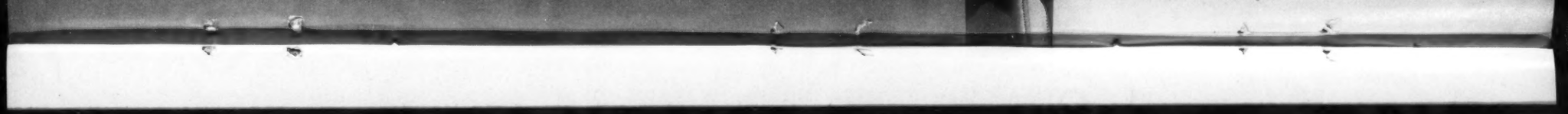
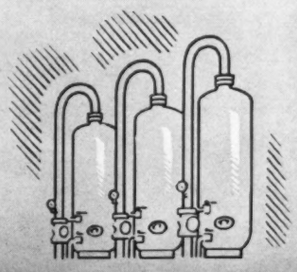


In INDUSTRY as well as in the HOME...
CLEAN GAS MAKES SATISFIED CUSTOMERS

Let Gas flow smoothly, silently, unfailingly and industrial customers find their production moves along like a song. And you find service costs fall to an all-time low. But, of course, these things happen only when Gas is *clean*. Today's small machine apertures, finely adjusted meters make that necessary. So follow in the footsteps of Operating Engineers from coast to coast. Pave the way for success in the industrial field by turning to the Gas Cleaners that never fail—Blaw-Knox Gas Cleaners. Start now and see for yourself that "as GAS flows, demand grows".



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GAS CLEANERS

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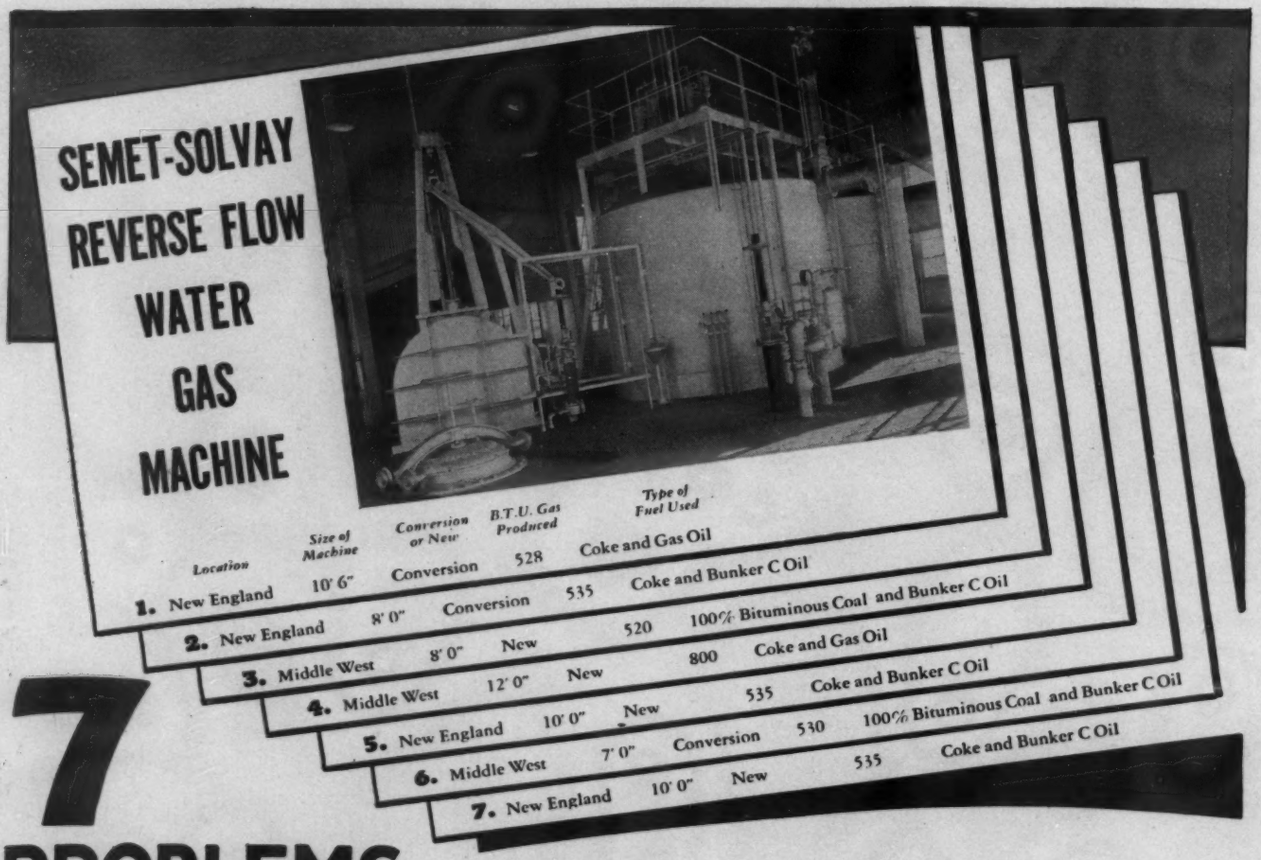
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REVERSE FLOW
WATER
GAS
MACHINE
Location
Size of Machine
Conversion or New
B.T.U. Gas Produced
Type of Fuel Used
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3. Middle West 8' 0" New 520 100% Bituminous Coal and Bunker C Oil
4. Middle West 12' 0" New 800 Coke and Gas Oil
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THESE seven recent installations—each presenting a different problem—have conclusively proved the superior versatility and adaptability of Semet-Solvay Reverse Flow Water Gas Equipment. In particular, these four outstanding features were demonstrated with amazing success:

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- That REVERSE FLOW is equally valuable for both new and conversion installation.

With this flexibility, every gas man will fully recognize possibilities, never before available, for new production methods and operation economies.

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HOW TO GET IT

This new Wilcolator Warranty Bond is available for every electric or gas range in your stock. Start now to benefit with this new Wilcolator sales clincher. Fill out this coupon and mail to THE WILCOLATOR COMPANY, NEWARK, NEW JERSEY.

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Recently reduced prices make this effective method of correcting leakage in dry bell-and-spigot joints even more economical...

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• • •

NEW YORK STATE—In a system consisting of 14.7 miles of 3-in. equivalent low-pressure mains and 4.7 miles of 3-in. equivalent mains carrying 5 to 8 pounds intermediate pressure, the latter were treated with "Carboseal" anti-leak in 1936. The unaccounted-for gas volume was reduced 85.3 per cent by December, 1938—two years after treatment. This reduction was largely due to "Carboseal" anti-leak. The low-pressure mains in this system will be treated this year.

MISSISSIPPI — Shut-in meter tests showed a leakage reduction of 97.5 per cent after "Carboseal" treatment. Soap tests showed that even "blowing" leaks were eliminated.

• • •

ILLINOIS — A utility treated 545 cement joints in 4-in. main with "Carboseal" anti-leak at a total cost of $442.68, or 81.2 cents per joint. The annual leakage per mile of 3-in. equivalent main fell 95.4 per cent.

• • •

GEORGIA — In June, 1936, "Carboseal" anti-leak was applied 6 times in 4 weeks to 44,000 ft. of 4-in. main. Total unaccounted-for gas volume was reduced 60 per cent and bar tests showed elimination of joint leakage. The loss remained the same when metered in June, 1938.

Widespread experience by over 250 users indicates that the cost of "Carboseal" anti-leak required to correct leakage per mile of 3-in. equivalent cast iron main has averaged ninety dollars. *The average cost per joint has been less than seventy-five cents.* With lower prices for "Carboseal" anti-leak, leakage in packed bell-and-spigot joints in dry distribution systems can now be corrected at *even lower cost.*

The Secret of "Carboseal" Treatment

Dry gas, when substituted for wet gas, causes leakage because the gas removes the moisture from the jute packing in bell-and-spigot joints. When the packing dries out and shrinks, the joint leaks where lead or cement caulking has failed due to expansion and contraction.

"Carboseal" anti-leak swells the jute packing and keeps it wet indefinitely. This scientifically developed liquid is applied by gravity and flows over the joints inside the mains to the drips, where the surplus is recovered for reuse. It can also be sprayed into the mains by means of a hose. Interruption of gas service is unnecessary. Expensive joint excavation is eliminated.

Joints Stay Tight

Joints treated in this way keep gas where it belongs and remain tight for years. A few actual case histories are reported at the left. Joints treated six years ago are still tight today on the soap test.

For further information about this effective and *now even less expensive* method of correcting bell-and-spigot joint leakage in distribution systems carrying dry manufactured or natural gas, write for "Carboseal" anti-leak bulletins G2-5, without obligation.

For information concerning the use of "Carboseal" anti-leak, address:

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Unit of Union Carbide and Carbon Corporation

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FOR DRILLING MAINS WITH ALL TYPES OF SERVICE CONNECTIONS

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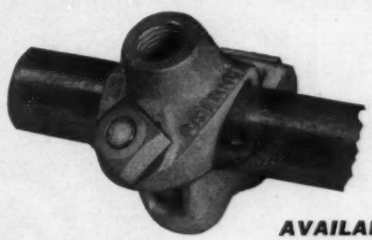

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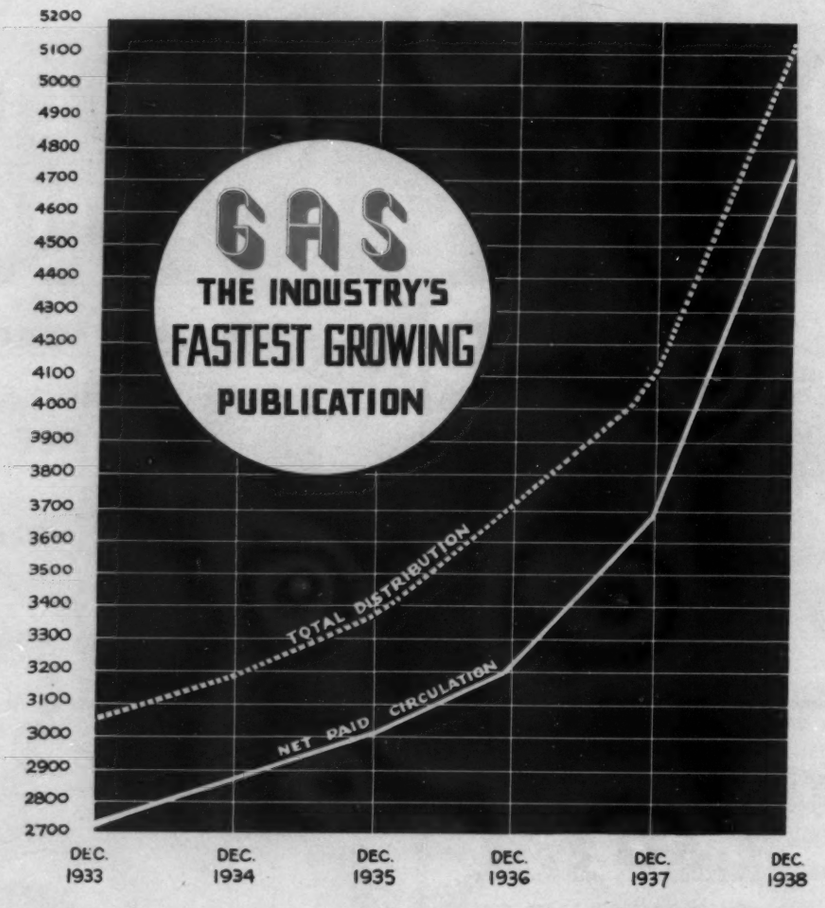

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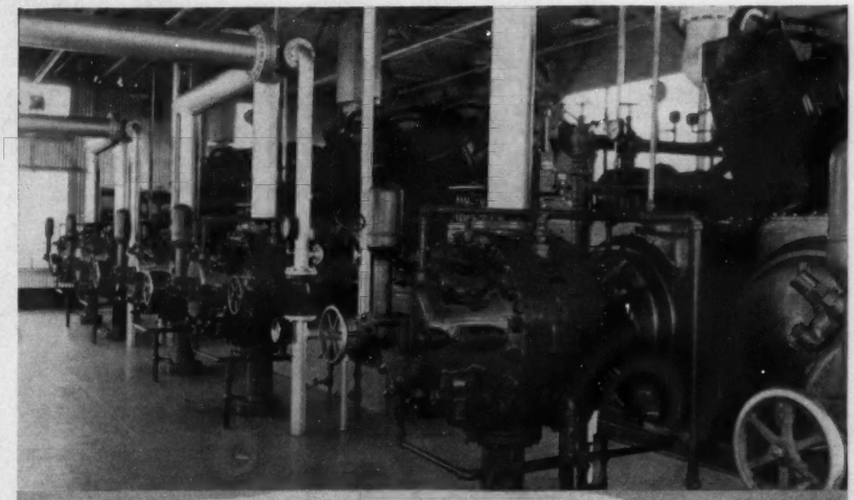
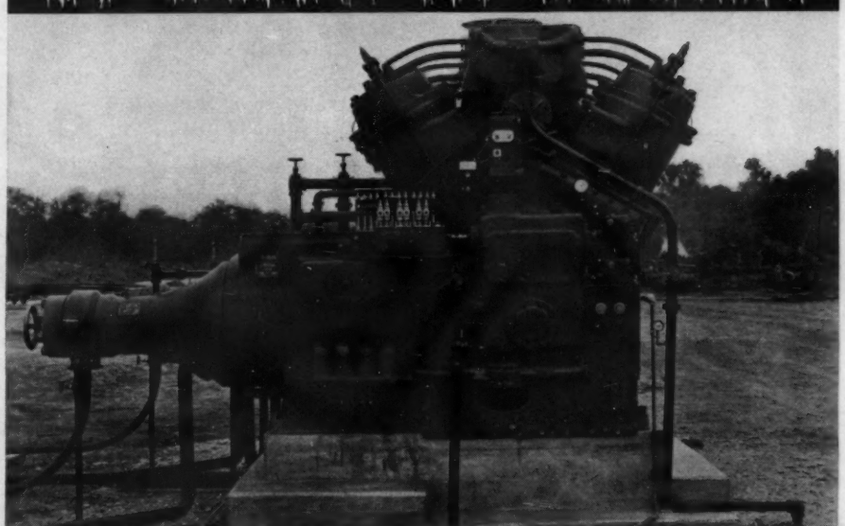


Turner Valley, Alberta, Canada . . . Three Type G-MV, 6-cylinder compressor units

51° BELOW IN CANADA



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Frigid cold or blistering heat . . . temperature changes mean nothing to these dependable compressors!

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TYPE G-MV's KEEP GOING!

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Raging Flood NO MATCH FOR NATIONAL SEAMLESS

Pipe line crossing over the Santa Clara River, as it appeared after the California flood of 1938. Rehabilitation work had not yet been started. Only one pipe—the painted line of NATIONAL Seamless—withstood the terrific pummeling of the flood.

Here's one pipe you can rely on when the "unexpected" happens

CALIFORNIA'S flood of last spring furnishes another dramatic demonstration of the strength and stamina of NATIONAL Seamless Pipe. Four pipe lines, three gas and one petroleum, crossed the Santa Clara River here. One of these was a 16-inch O.D. gas line from the San Joaquin Valley Field. This particular line was of NATIONAL Seamless Pipe.

On the day before the flood struck, all four lines were operating satisfactorily, and there was no reason to anticipate trouble. Then the rains came, the waters rose, and without warning, California found itself in the grip of the worst flood in its history. The little Santa Clara River, usually dry, quickly turned into a raging torrent. Ripped out bridges, destroyed walls and trestles. One by one, three of the pipe lines yielded to the swollen stream.

Later, when the waters subsided, and rehabilitating crews worked their way into the flood-torn area, they made what to them seemed a remarkable discovery. Here, where the four pipe lines had crossed the Santa Clara, three were bent and twisted.

The fourth, of NATIONAL Seamless Pipe, remained intact—just as straight and erect as the day it was installed. Close inspection showed that no repairs to the pipe line itself were necessary.

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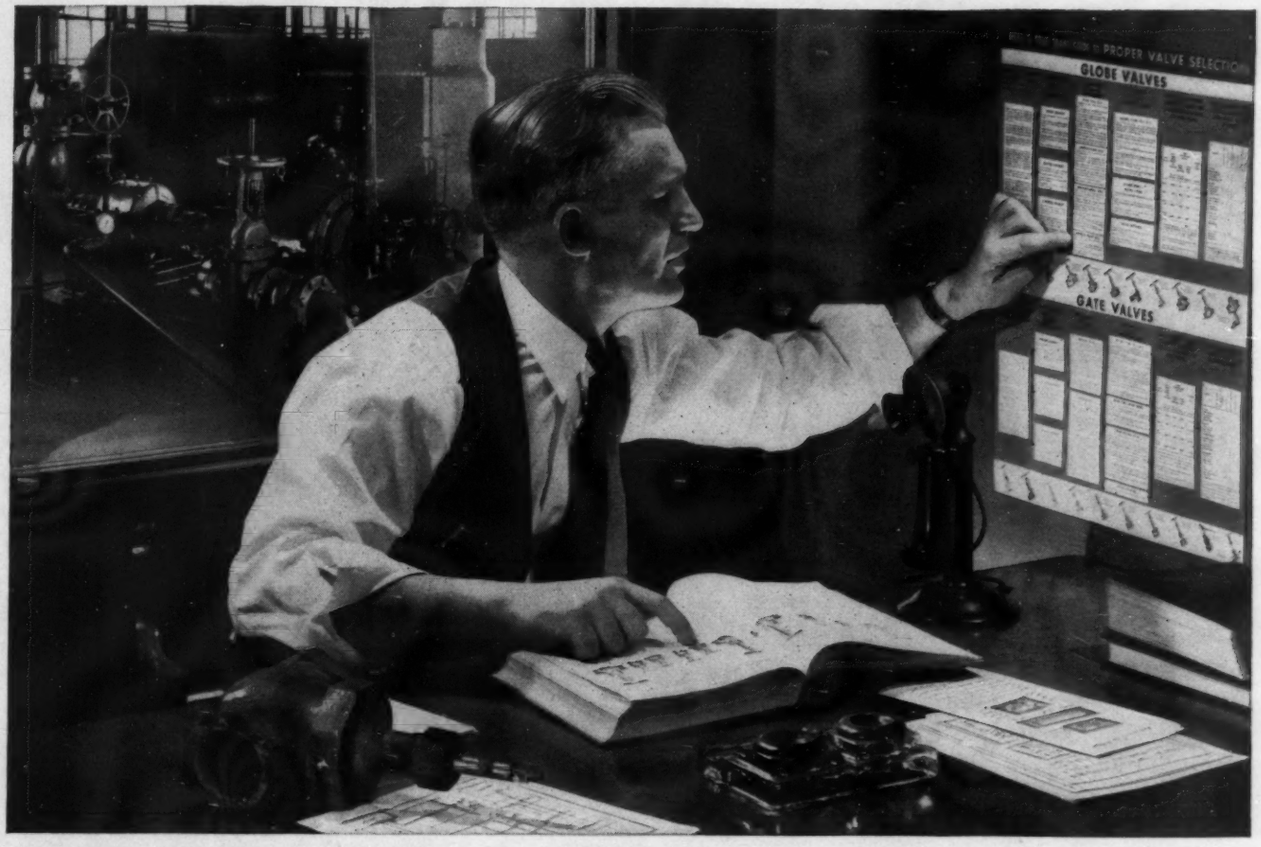

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ECONOMICAL valve performance begins with proper valve selection. In the broad line of valve types offered to industry today, there is one that is best suited for each service in your plant—one that will give dependable flow control at reasonable cost. "Trouble spots" and their high maintenance costs often result solely because of a mismatch of valve and operating conditions.

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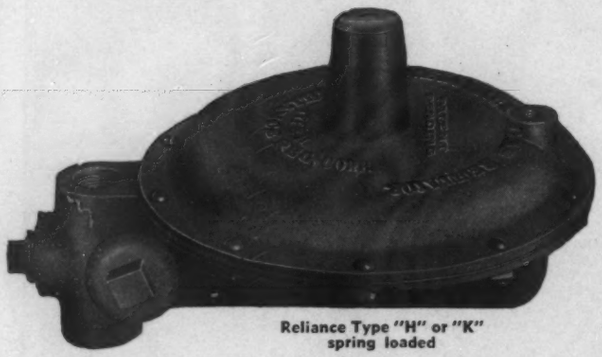

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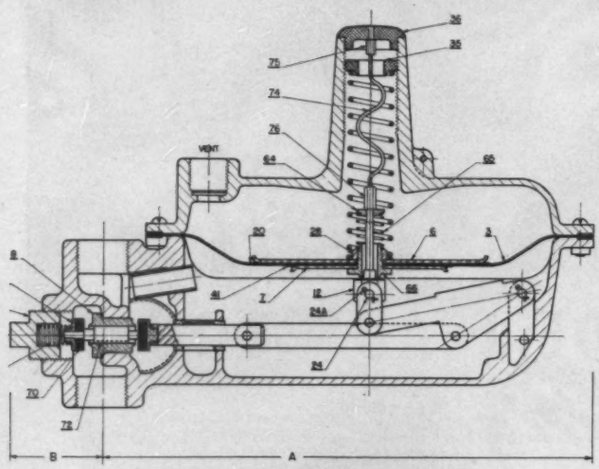

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The exceptional economy of Reliance Type "H" and "K" Regulators in service lines where dust troubles exist results from the possibility of changing the valve and blowing out the dust without removing the Regulator from the line.

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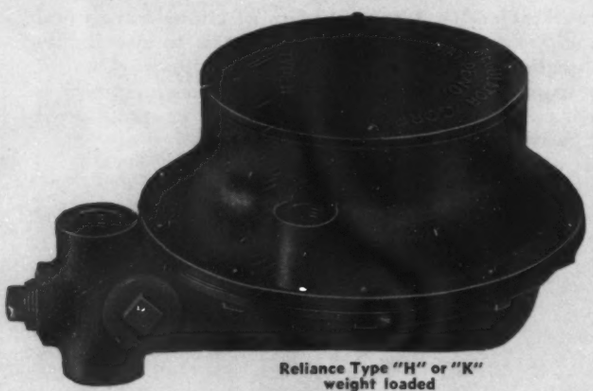
These regulators can be equipped with internal mechanical relief valve, utilizing main diaphragm to operate relief valve mechanism, allowing excess pressure to escape to atmosphere, through center valve carried by diaphragm plates; relief valve settings can be made over a range between 8" and 30" of water pressure.



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This feature can be furnished also, either with or without safety relief valve as desired. (See cross section at the left.) Shutoff valve closes the flow of gas in case of ruptured diaphragm or broken house or service lines, and regulator remains closed until trouble is repaired. It is then manually reset by pulling upward on copper wire cable attached to under side of cover cap screw.

Send for Bulletins No. 38 and No. 41

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RELIANCE REGULATORS

Q: what is the logical and most *popular* control for all gas heating appliances

A: GENERAL CONTROLS' B-60 SERIES AUTOMATIC GAS ACTUATED CONTROL

and here it is in the *popular* T-85 PACKAGE SET

NO ELECTRICITY NEEDED
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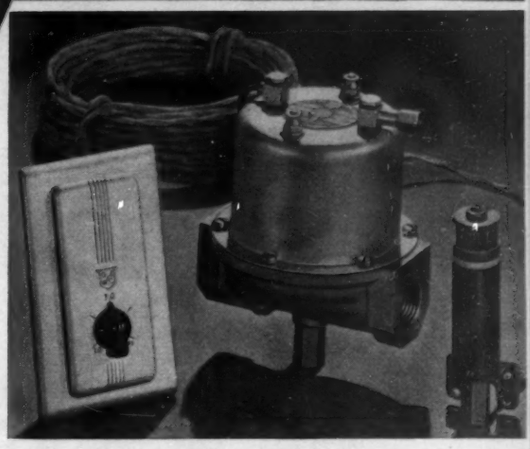
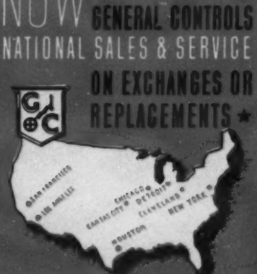


Country-wide acceptance of General Controls Gas Heating B-60 Series Controls has been immediate! Here is substantial proof for you that this automatic gas actuated control is the *right* control for every gas heating job. Remember this, there's nothing else like it. General Controls Pilot Generator, supplying actuating current to the gas valve is unique. Quiet and dependable, this trouble-free feature brings automatic gas heat within the financial means of tens of thousands of small home owners. And, first cost is low; the self-contained unit can be installed by the gas fitter. Package Sets contain everything needed for the average installation. You must investigate these amazingly successful controls today.

NOW TAKE ADVANTAGE OF GENERAL CONTROLS NATIONAL SALES & SERVICE ON EXCHANGES OR REPLACEMENTS ★



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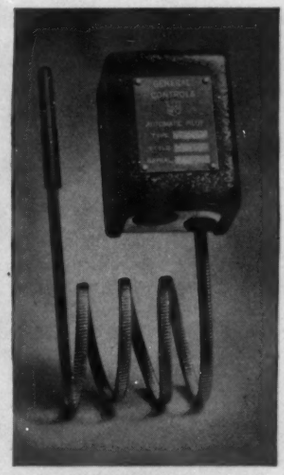

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Applying flame to thermocouple tip makes electric contact, allowing main gas valve to open. Pilot light failure opens circuit. Automatically resets when the pilot is relighted. Now, with flexible lead connections.

THERMOVALVE MR-2
Utilizes same pilot flame failure principle as thermopilot, but permits a manually reset valve to shut off gas flow resulting in 100% shut-off. Operates horizontally or in any desired position. Now, with two wire flexible lead connections.

Write today for our new Bulletin giving complete information on the General Controls B-60 Series Controls—and the complete General Controls line.

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TYPE 860

FISHER TIME-TEMPERATURE BOOSTER

controls and adjusts reduced pressures automatically according to atmospheric temperature changes

These new FISHER Time-Temperature Boosters are especially designed for low pressure distribution systems which are subject to peak loads caused by residential heating demands. They are automatically actuated by the primary cause of the demand load — namely, atmospheric temperature changes.

ADAPTABLE TO ALL LOW PRESSURE SYSTEMS

Several FISHER Time-Temperature Boosters may be installed on a common distribution system without robbing the load from each other. This is true because they are actuated by temperature change which occurs uniformly throughout the system. Therefore, the FISHER Boosters commence to function at the same time and cannot rob each other.

Ingenious adjustment features add greatly to the flexibility of the FISHER Booster and make it readily adaptable to all types of distribution systems.

CLOCK CUTS BOOSTER IN AND OUT

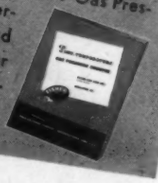
Each Booster is equipped with a Time Control designed to automatically cut out the boosting action during the night when the load returns to normal, regardless of temperature conditions, and return the booster to its normal function in the morning. In this way, distribution pressure is kept at a minimum and "unaccounted for" gas reduced. Investigate this new money-saving regulator at once!

FISHER TIME-TEMPERATURE BOOSTER DOES THESE 3 THINGS FOR YOU

- Eliminates countless man hours, truck hours and mileage now devoted to manual adjustment of district regulators.
- Reduces "unaccounted for" gas by lowering average distribution pressure.
- Reduces consumer complaints because system pressure is automatically increased 30 to 90 minutes before increased load actually comes on.

SEND FOR FREE BOOK

Contains complete information on FISHER Time-Temperature Gas Pressure Boosters, interesting charts, and prices. Write for your FREE copy today! No obligation.



Fisher Sales Representatives in Every Principal City

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801 Fisher Building **Marshalltown, Iowa**

★PERFORMANCE

The Universal Gas Range, with its advanced devices, introduces a new and higher standard of cooking performance, thus assuring consumer satisfaction and a new appreciation of the outstanding advantages of gas as the ideal cooking fuel.

★STYLING

The Universal Gas Range is styled for beauty. With its smooth, flowing lines and graceful symmetry, it imparts a new and more modern note to gas range design. The Universal has compelling eye appeal that commands consumer attention.

★SALABILITY

The sum total of the advantages the Universal Gas Range presents from a marketing standpoint is enthusiastic consumer acceptance, which briefly interpreted means ready salability. The Universal line embraces a style and model to meet every existing consumer demand. The Universal Gas Range has definite sales appeal.

★PLUS A PLANNED SALES PROGRAM

Universal offers an advertising and selling program complete in every detail. (1) Planned sales campaigns; (2) Salesmen's educational material; (3) Consumer educational material; (4) Window and floor display; (5) Comprehensive newspaper advertising layouts; (6) Direct-by-mail broadsides; (7) Circulars; (8) Sales Manual; (9) A powerful sales story based on the woman's interest.

UNIVERSAL GAS RANGES

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GAS
MAY, 1939

GUEST Editorial

Air Conditioning

The No. 1 Sales Opportunity That Will Level the Valley In the Industry's Load Curve

By THOS. R. WEYMOUTH

Chairman, Natural Gas Section
American Gas Association

ONE of the outstanding events in the life of the gas industry was the invention of the gas refrigerator about 15 years ago. We are now about to witness the beginning of another development in the utilization of gas, which should have an even more important effect upon the growth of the industry and one which, in addition, should materially improve the character of the service. Gas fired air-conditioning equipment is now being demonstrated which provides completely automatic control, within limits, of both temperature and humidity at pre-determined values required for maximum comfort.

One of the most serious problems of the industry is the inherently poor load factor of its domestic load, especially where there is a large saturation of househeating business. Fixed charges on a large investment have an unfortunate habit of piling up day after day irrespective of the degree to which the gas system may be loaded. Any sales which can be utilized to fill the valley of the load curve not only improve the load factor of the system but also make it profitable to increase the volume of househeating sales. The industry is constantly searching for business of this character, and one of the most promising fields for this search is the use of gas for air-conditioning which is on the threshold of intensive development.

Proper air-conditioning means more than the reduction of temperature of the air below that of the surrounding atmosphere. Control of humidity is probably more important than control of temperature, although a satisfactory solution of the problem requires control of both. Fortunately for the industry, gas offers the ideal medium for attaining this end, and equipment is now available which is not only simple and dependable in operation, but the cost of which is within the reach of the average househeating customer. When one considers the large proportion of total sales comprised in househeating, especially in natural gas areas, one can appreciate the opportunity for expansion of business which is offered by this development in air-conditioning. Furthermore, the more aggressively it is pushed by the industry, the more rapidly it will develop and the cheaper will the cost become. The experience with the gas refrigerator should teach us that enlightened self-interest demands that the industry get behind this new development with all the energy at its command and take advantage of the wonderful opportunities presented by it.

BEHIND THE SCENES...

● The New York and Golden Gate expositions are demonstrating gas utilization methods to millions . . . showing the impressive advance in fitting gas-burning appliances into the modern environment. The gas industry's 1939 nation-wide educational campaign should bring new business and profit to the entire industry!

In the scenes back of gas ranges, water and space heaters, furnaces, refrigeration and air-conditioning equipment, industrial gas-burning devices . . . are the engineering activities of gas production and distribution. Not the least of these is accurate gas measurement, with its influence upon economical gas use and progress.

AMERICAN gas-measuring instruments have pioneered for over a century. For example, AMERICAN Tinned Steelcase Meters (see new Catalog TG-4) and METRIC-AMERICAN Ironcase Meters (Catalog EG-40) are giving new value to your meter dollar invested . . . are consistently promoting your customers' good-will.

FACTS EVERY GAS MAN SHOULD KNOW . . .

- $5,000,000,000 approximate total investment represented by U.S.A. gas companies! ($4,200,000,000 is the investment figure for Steel.)
- Gas Industry capital investment of $37,000 for every employee. ($25,000 for Railroads; $7,000 for Steel; $3,000 for the Automotive Industries.)
- Total annual payroll of over $213,000,000 for the Gas Industry's 135,000 employees—$1,575 per employee. (Exceeds very substantially the average annual wage in the Automotive and Steel industries.)
- Gas Industry's 48-hour week in 1929 reduced to 40 hours by 1936—yet the 1936 average annual wage per employee was slightly higher.
- 40¢ paid Government by the Gas Industry in taxes, for every dollar paid in wages.

GENERAL OFFICES • 60 EAST 42ND STREET, NEW YORK, N. Y.

AMERICAN METER COMPANY

INCORPORATED (ESTABLISHED 1836)

1198

THERMALLY *Thinking*

By Stanley Jenks, *Editor*

Humanizing Annual Reports The Johns-Manville Corporation is to be congratulated on the skillful way it has simplified its annual report and therefore made it understandable to its employes, in a booklet entitled *The Year 1938—President Lewis H. Brown's Annual Report to Johns-Manville Jobholders.* Always at the head of the procession, Johns-Manville sets a new standard in recognizing the supreme importance of taking its employes into its confidence to offset much of the erroneous propaganda from political circles to discredit "big business." Today, when any employer larger than the corner delicatessen is an "economic royalist" or a fair target for demagogic mud-slinging, business has everything to gain and nothing to lose by explaining itself to its jobholders. Any company with an annual sales volume of $51,699,063—a fourth less than in 1937—is "suspect" to the Washington Ogpu. But when you take that Johns-Manville gross income dollar and see that 32 cents of it went to employes for salaries and wages, only two cents went to stockholders, another cent to reserve, and the other 65 cents for taxes, materials, transportation and other expense, you know the worst—and the best!

Yes, sir! The American system has its merits, despite the loud-mouthed, glib-tongued "ism" theorists, whose theoretical Utopias are such, mainly because they happen to be on the other side of the fence.

Fuel Value Received A year ago, as natural gas men flocked to the New Orleans convention, the convention's slogan, "Our Job Is a Selling Job," echoed a heart-felt conviction that we had about everything except the volume of business we should be handling, and the sooner we got it, the sooner would the sun be shining again on deserving natural gas men. At the convention—and what a program it presented—we learned of proved reserves of natural gas, adequate at present demands to last well beyond the lifetime of most of the men there, and this without any credits for the new supplies that were being discovered at a rate faster than present resources were being depleted. At New Orleans, optimism prevailed. Nothing has happened within the industry since then to prove our optimism unfounded.

On the eve of our nation-wide trek to Tulsa, Okla., for this year's annual convention of the natural gas section, we find the spirit of the industry reflected in this year's convention slogan, "Natural Gas—Fuel Value Received." Insiders, of course, will immediately grasp the full significance of such a pertinent slogan. It suggests a high calorific value fuel that delivers the goods without any of the inherent disadvantages of other fuels. Its ease of regulation and control, the highly efficient equipment available for its utilization are further factors ensuring that "fuel value received" goes to the user.

Details of the program appear on later pages, and so high is its standard and so complete its scope, that one can hardly comment here on this or that feature, wthout a guilty feeling of discrimination against all.

However, I must pay a well deserved tribute to Tom Weymouth, whose guest editorial precedes this page, and E. Holley Poe, the indefatigable secretary of the natural gas section. From first-hand observation, I know what a splendid national chairman Mr. Weymouth has been, and how arduously both Holley Poe and he have worked in planning and arranging this program. On paper, they have the best potential program in the history of the natural gas section. The anticipations of the better than two thousand expected delegates, will be more than realized.

Appliance Quality and Price It has been my pleasure recently as a judge in the national water heater prize essay contest to read ideas and suggestions from all over the country on "The value of the water heating load and how it may be secured." The general stan-

dard was surprisingly high, and there seemed to be a unanimity of thought that the water heating load is valuable and worthy of special effort. But, when it came to suggestions of how to secure it, there were enough differences of opinion to emphasize that there is no single approach to the problem. The best solution is that which makes certain fundamentals fit the local situation. But, there was one thought I found echoed in several essays and that was the conflicting demand for more efficient units in one breath, as it were, and lower prices in the next. Which is absurd, as Euclid, my schooldays' bane, used to say.

A couple of months ago on this page, I took issue with the "chiselling" tactics of some utility merchandising men. Competition among manufacturers will ensure that prices are fair and reasonable. At that time, I pointed out that there is a constructive need for a manufacturer's profit in this industry. Since then, I have seen several annual reports of our gas appliance manufacturers, and proved to myself that such profits are indeed few and far between. The soundest way to lower prices without any sacrifice of quality lies in standardization. A utility executive has put it this way: "If the cheaper form of a range is to be popularized, cuts in profits and sacrifices must not be made solely by the manufacturers, who after all make but one profit and that is the initial one. . . . We agree in the great advantage of standardization, which should not mean entirely the setting up of specifications for performance, material and design, but rather *the avoidance in a given design of individual requests for slight modifications which may be thought by the gas company in question to be a definite requirement of the people in their area, but which all too frequently are really the expression of opinion of their own officials who have assumed that their particular preference is also the general preference. Such alterations are costly and defeat the effort made to keep down costs by mass production. The majority of these variations do not affect the efficiency of the appliance on the customer's premises . . . a greater appreciation of manufacturing difficulties and costs would be in the best interests of the gas industry.*"

Dallas—World's Champions?

C. K. Patton, new business manager of the Dallas Gas Co., claims the gas automatic water-heating and space heating championship for Dallas in the over 50,000 population class. Last December, in this column I advanced the claims of Denver, Colo. Roy G. Munroe, in charge of miscellaneous new business activities of the Public Service Co. of Colorado, had written us a letter in which he proved that in Denver they enjoyed a 44.5 per cent saturation of automatic water heaters, and a further 20.0 per cent saturation of gas space heating. Both these figures are so far above the national average, that we immediately recognized an outstanding job, and in the absence of better performance records, hastened to hand the championship pennant to Denver.

It would seem we spoke too soon, for now Mr. Patton shows that we were wrong in leaving out Texas in general, and Dallas in particular, from our calculations. He writes, in part, as follows:

> I note in the December issue of *GAS* on page 10 that Denver makes a claim to "world championship" automatic gas water heater and home heating saturation. Did not someone overlook Dallas when looking out over the world?
>
> According to the Real Property Inventory made by the Civil Works Administration Project in Dallas in 1934, the total number of dwelling units amounted to 83,628. Of these, they showed 64,448 or 76.2 per cent heated with gas.
>
> We had in Dallas as of December 1934, 59,069 domestic meters (we now have 68,225—an increase of 15.5 per cent—just a sample of the way our city is growing). The above C. W. A. report shows 64,448 families using gas for heating, which is about 5000 more than we had meters. This is apparently accounted for by single meters in multiple dwellings—at any rate—I do not think it requires any further proof to say we have practically 100 per cent gas heating saturation.
>
> The breakdown of the above C.W.A. report also shows that 53,475 of the total 83,628 have *HOT* and cold water. This figure represents water that is heated with automatic gas water heaters. Again considering the fact that we had 59,069 domestic meters and applying this against these 53,475 homes that have *HOT* water service furnished entirely by automatic gas water heaters (there are practically no coal or electric water heaters in Dallas), we arrive at the situation in automatic water heating of a little better than 90 per cent.
>
> Therefore, you see Dallas has practically 100 per cent saturation in gas heating and 90 per cent automatic gas water heating. Now let the other claimants to this title come forward. We do not know whether we should claim the world championship or not, but probably we should until you hear of a better job than that cited.
>
> C. K. PATTON,
> *New Business Manager.*

There has been, in the friendliest spirit, an exchange of letters on this subject between Messrs. Patton and Munroe. For example, Mr. Munroe quite logically queried the point that all hot water users could be claimed as automatic gas water heater users. Mr. Patton replied, "This statement is literally true, but I do know that we have a very, very few tank water heaters with the burner under the tank operating manually and practically no side-arm heaters. According to our actual survey and based on a further check with the sales and service departments, I find that these hand-operated heaters will not average more than one out of 150 heaters; therefore, out of the 53,475 we claim, you may eliminate 356 as non-automatic. All the others are automatic, and I mean automatic in the true sense of the word—they are either of the coil automatic type or tank heaters with automatic thermostat."

So, until someone proves a better job the championship pennant goes to Dallas, where according to Mr. Patton they have "that world-famous Dallas skyline without a single coal-smoke blemish and its clean, glistening buildings undefaced by coal or oil smoke."

THE NATURAL GAS INDUSTRY

An Expanding Service

By PAUL RYAN

Chief Statistician, American Gas Association

ONE of the most phenomenal industrial developments in the United States during the past few years has been the rapid growth and expansion of the natural gas industry.

When man first discovered the existence of natural gas is unknown. At least 1000 years ago the Chinese produced it from wells 2000 ft. deep, transmitting it through bamboo pipes and using it to evaporate salt brine and for domestic purposes. In Japan gas wells were known as early as 615 A. D. At an early date the City of Genoa, Italy, was lighted by gas from the wells of Anniamo, in Parma, and this was probably the first commercial use of natural gas in the Western World.

In the United States the presence of natural gas was detected in springs, in West Virginia, as early as 1775 and in 1815 it was produced from a salt well at Charleston, W. Va. In 1821 gas from a spring at Fredonia, N. Y., was accidentally ignited by a lantern, and near this spring, in the same year, the first gas well was drilled to a depth of 27 ft. The earliest authentic record of natural gas being used commercially in this country was on June 4, 1825, when it was used to light the town of Fredonia, N. Y., upon the occasion of the visit of General Lafayette. In 1840, natural gas was used near Centerville, Butler County, Pa., to evaporate brine in the manufacture of salt. This was probably the first instance of the use of natural gas for industrial purposes in the United States.

The first corporation formed in the United States to engage in the natural gas business was the Fredonia Gas Light Co., organized in 1858.

Development of the natural gas industry in the Appalachian Field dates back to about the year 1870. In 1883 Chartier's Valley Gas Co. was organized to bring gas to the mills and glass factories in Pittsburgh. Shortly after the year 1900 an expansion of the industry began in this area, and by 1910 practically all of Western Pennsylvania, Northern West Virginia and the entire State of Ohio were being served with natural gas from Pennsylvania, West Virginia and Ohio Fields. There grew up in these states a vast network of gas gathering, transportation and distribution systems, which are still in service today.

In the Mid-Continent Field, gas was first discovered in Kansas in 1873, but distribution to consumers did not begin until 1884. After that time, as new deposits were discovered various communities were served from nearby fields. In 1904 the gas distributors in Kansas consolidated their interests, forming the first important gas company in that state, known as Kansas Natural Gas Co. During this period,

COMPARISON OF EMPLOYES, SALARIES AND WAGES, INVESTMENT AND TAXES OF SEVERAL INDUSTRIES IN THE UNITED STATES

Industry	Number of Employees	Annual Salaries and Wages	Taxes	Total Investment	Taxes per Employe	Investment per Employe
1. Railroads	1,090,000	$1,891,134,000	$ 324,900,000	$25,500,465,000	$ 298	$23,390
2. Petroleum	1,000,000	1,500,000,000	1,180,876,000	13,775,000,000	1,181	13,780
3. Steel	613,700	1,124,444,000	169,086,000	4,349,817,000	276	7,090
4. Automobile	517,000	806,000,000	*	1,369,631,000	*	2,650
5. Telephone	281,941	434,018,000	121,477,000	7,196,668,000	431	25,530
6. Electric Light and Power (Private)	280,000	420,000,000	330,000,000	12,500,000,000	1,179	44,640
7. Natural Gas	65,700	98,156,000	41,109,000	2,719,535,000	626	41,390

*Not available.

SUMMARY OF GAS SERVICE AND GAS APPLIANCES

(Used in 104,078 New Homes Constructed During 1938*)

Gas	No. of New Homes	Cooking	Per-cent	Water Heating	Per-cent	Refriger-ation	Per-cent	House Heating	Per-cent	Gas for 4 Big Jobs	Per-cent
Natural	68,038	61,345	90.2	60,458	88.9	7,161	10.5	52,904	77.8	6,843	10.1
Mixed	7,199	6,411	89.1	5,648	78.5	1,718	23.9	3,032	42.1	935	13.0
Manufactured	28,841	23,952	83.0	11,003	38.2	3,736	13.0	3,011	10.4	1,972	6.8
Total	104,078	91,708	88.1	77,109	74.1	12,615	12.1	58,947	56.6	9,750	9.4

*Meters represented by above figures: natural gas, 3,414,640; mixed gas, 1,560,831; manufactured gas, 4,842,050; total miles, 9,817,521.

and principally after 1912, a number of gas systems were developed in Oklahoma, Northern Texas, Arkansas and Louisiana, until by 1925, the business had expanded into a large industry. The year 1925 marks the discovery of the two largest known gas fields, viz: the Amarillo Field in the Texas Panhandle and the Monroe Field in Northern Louisiana.

32 Million Use Gas

Today, towns and cities with a population of more than 32,814,000 people have available the innumerable conveniences afforded by this modern fuel —natural gas.

The automobile business has long been considered one of the most basic of the great industries of the United States, affording employment to many thousands and manufacturing a product which has become essential to the complex industrial civilization of this country.

Yet the average person would probably be surprised to learn that the investment in the natural gas industry is more than double the amount of capital employed in the production of automobiles. While some $1,369,631,000 has been invested in the automotive plants of this country, over $2,700,000,000 of capital is required to provide natural gas service to the 7,220,000 customers of this great industry.

Approximately 66,000 people are employed by the natural gas companies of this country at an annual payroll in excess of $98,156,000. An interesting side-light to the contribution of the gas industry toward improved living conditions for the workers engaged in supplying this essential service is indicated by the fact that, whereas in the peak year 1929 the average employe in the natural gas industry worked 49 hours per week, by 1937 this had been reduced to 40 hours per week, and yet his average weekly earnings for the 40 hour week were nearly nine per cent higher than in 1929.

An important factor in this accomplishment, and in the maintenance of the high standard of service to which natural gas customers have become accustomed, is the tremendous amount of capital that stands back of each worker in the natural gas industry. For example, in the automobile industry, approximately $3,000 has been invested in plant and machinery for each worker employed. In the case of steel, this figure is about $7,000, while the railroads have an investment of approximately $24,000 for each employe. Yet the average worker in the natural gas industry has behind him the tremendous investment of $41,000.

One of the outstanding developments in the natural gas industry during the past decade and a half has been the expansion into territories and markets formerly served with manufactured gas.

In 1937 there were some 84 former manufactured gas companies distributing straight natural gas of approximately 1000 B.t.u. to 1,991,911 customers who purchased 154,099,849 M c. f. of natural gas or 1,540,998,490 therms, for which they paid $89,598,353, an average rate of 5.8¢ per therm.

In 1923 these same companies were distributing manufactured gas of about 530 B.t.u. to 1,412,662 customers who purchased 60,458,813 M c. f. of manufactured gas or 320,431,700 therms, for which they paid $58,028,262, an average of 18.1¢ per therm.

In addition there were in 1937, 28 former manufactured gas companies serving mixed gas of approximately 840 B.t.u. to 1,771,841 customers who purchased 60,800,039 M c. f. of mixed gas or 510,720,328 therms for which they paid $66,489,987, an average rate of 13¢ per therm.

In 1923 this same group of companies sold manufactured gas of approximately 530 B.t.u. to 1,429,813 customers who purchased 63,459,320 M c. f. of manufactured gas or 336,334,396 therms, for which they paid $59,803,023, an average rate of 17.8¢ per therm. In other words, the number of consumers actually using gas in 1937, had they paid the rates of 18.1¢ and 17.8¢, respectively, in force in 1923, would have had to pay $124,260,500 more for the equivalent service in 1937 alone.

In the 15-year interval from 1923 to 1937, manufactured gas has been replaced by natural gas or mixed natural and manufactured gas in communities with a population of nearly 19,800,000 people, and approximately 3,764,000 customers have been affected by the change. During this same period natural gas has been made available to over 2,300,000 customers who had not previously been served with any gas fuel.

The Industry Compared

In considering this expansion of the natural gas industry, the question naturally arises of its relationship to other phases of the public utility business.

For example, it has been pointed out that in 1938 revenues of the Electric Utilities aggregated $2,172,750,000, while revenues of natural gas utilities were only $419,474,000. Such a superficial comparison, however, ignores some of the basic differences inherent in these two branches of the utility industry, and has been responsible for many of the erroneous conclusions concerning the relative status and functions involved in the supply of gas and electric energy.

For example, in 1938 the electric companies sold to consumers some 93,400,000,000 kilowatt hours. Reduced to a common denominator, or thermal basis, this amounted to 319 trillion British thermal units. During that same year natural gas utilities sold 1,203,553,000,000 cu. ft. of natural gas, which reduced to the same common denominator or thermal basis, amounted to 1203 trillion British

MILES OF MAIN IN USE BY THE NATURAL GAS INDUSTRY IN THE UNITED STATES (1933-1937)

	1937	1936	1935	1934	1933
Transmission	81,000	80,500	79,600	78,800	78,200
Distribution	101,000	98,500	95,400	94,200	92,800
Total	182,000	179,000	175,000	173,000	171,000

EMPLOYES AND PAYROLL OF THE NATURAL GAS INDUSTRY IN THE UNITED STATES (1929-1937)

Year	Number of Employees	Annual Payroll	Average No. of Hours Worked Per Week	Average Weekly Pay
1929	67,700	$93,674,000	49	$26.48
1930	60,000	83,721,000	49	26.83
1931	54,100	76,505,000	46	27.19
1932	51,200	69,939,000	46	26.27
1933	52,200	68,225,000	43	25.13
1934	56,900	79,148,000	39	26.75
1935	58,800	87,024,000	40	28.46
1936	65,200	94,902,000	39	28.00
1937	65,700	98,156,000	40	28.73

COMPARATIVE ESTIMATED DATA ON DOMESTIC APPLIANCES (1929-1938)

Domestic Appliance Sales—Thousands of Units

Type of Appliances	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Gas Ranges	1,013	1,420	1,464	1,109	844	711	628	984	1,375	1,600
Gas Refrigerators	185	265	200	160	120	80	100	85	65	50
Gas Fired Central House Heating Installations*	90	100	70	68	39	51	118	102	36	30
Gas Water Heaters	740	850	690	549	467	385	448	638	766	895
Electric Ranges	275	405	318	215	123	50	60	115	180	158
Electric Refrigerators	1,240	2,310	1,996	1,568	1,283	1,016	798	906	791	778
Electric Water Heaters	100	115	104	70	.....	.....	.....	.....	.....	.....
Oil Burners	159	219	225	157	110	89	86	104	126	131
Oil Range — Burners	193	321	243	207	132	180	224	148	76	.....
Oil Burner — Space Heaters	370	487	371	247	129	76	44	43	39	.....
Oil Burner — Water Heaters	37	27	21	12	9	.....	.....	.....	.....	.....
Coal Stokers	87	94	78	41	23	14	.....	.....	.....	.....

Domestic Appliances in Use at End of Year—Thousands of Units

Type of Appliances	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Gas Ranges	16,135	15,943	15,484	15,149	14,821	14,462	14,463	14,975	15,127	14,801
Gas Refrigerators	1,310	1,125	860	660	500	380	300	200	115	50
Gas Fired Central House Heating Installations*	825	735	634	566	498	459	408	290	188	148
Gas Water Heaters					Not Available					
Electric Ranges	2,275	2,119	1,735	1,449	1,256	1,148	1,100	1,095	1,020	875
Electric Refrigerators	12,101	11,400	9,200	7,000	6,020	4,900	4,300	3,499	2,625	N. A.
Electric Water Heaters	389	289	174	70	.....	.....	.....	.....	.....	.....
Oil Burners	1,659	1,544	1,356	1,155	1,014	920	843	761	655	548
Oil Range — Burners	1,535	1,377	1,120	926	760	628	449	224	.....	.....
Oil Burner — Space Heaters	1,684	1,351	913	579	332	203	127	83	.....	.....
Oil Burner — Water Heaters	117	82	55	34	22	.....	.....	.....	.....	.....
Coal Stokers	337	250	156	78	37	17	.....	.....	.....	.....

*NOTE: While no comparative data is available on gas space heaters, unit heaters, etc., the U. S. Census of Manufacturers report 886,000 units sold during 1937. It is estimated that at the end of 1938 there were approximately 1,400,000 dwellings heated by such gas appliances, giving a total of more than 2,225,000 homes in the United States heated by gas.

thermal units, or nearly four times the quantity of energy distributed in the form of electricity.

Reducing these astronomical figures to unit terms may perhaps make this point clearer. If a buyer were in the market last year for a million British thermal units of energy, he could purchase them in the form of natural gas for $0.35, and in the form of electric energy for $6.82.

It is doubtless for this reason that the electric industry is to an increasing extent, turning to natural gas as an economical and dependable method of power production. In 1938 approximately 173 billion cu. ft. of natural gas were used as fuel for generating electric power. That is to say, nearly one-fifth of all the steam generated electricity of this country was produced by natural gas.

Preliminary estimates indicate that the total production of natural gas in 1938, including amounts used in the manufacture of carbon black and for field purposes, reached an all time high of more than two and one-half trillion cu. ft., or more than two per cent above the previus peak established in 1937.

Sales of natural gas for domestic uses, which are influenced to a considerable extent by temperature variations, registered a decrease, falling from 360,284,000,000 cu. ft. in 1937 to 349,285,000,000 cu. ft. in 1938, a loss of 3.1 per cent. This was to have been expected in view of the fact that the number of degree days (the gas industry's standard measure of weather conditions) for a group of the larger cities served with natural gas was more than 15 per cent below the previous year.

Sales of natural gas for industrial and commercial purposes in 1938, a year of marked industrial recession, also declined.

1939 Upturn

The first quarter of 1939, however, witnessed a definite upturn in all phases of the industry's activities. Preliminary estimates indicate that domestic sales were 12 per cent above the first quarter of 1938. Sales to industrial customers were up six per cent, while commercial sales gained 12 per cent.

That this upturn may be expected to carry through the year with increasing momentum is indicated by the results of a recent survey. Reports were received covering the utility characteristics of more than 104,000 one and two family homes constructed in 1938, this group accounting for nearly 70 per cent of the entire number of one and two family homes erected in the United States during that year.

Of the 104,000 homes reported on, 68,000 were located in territory served with natural gas. For this latter group of new and modern dwellings, 90 per cent reported the use of natural gas for cooking, 89 per cent reported natural gas for water heating, 78 per cent used natural gas for house heating, while 10 per cent reported the installation of new gas refrigerators.

When it is considered that these dwellings represent the most modern conception of design and serviceability, it is evident that natural gas service has not only maintained but even enhanced its acceptance as an integral part of the home of tomorrow, and affords additional assurance of the continued progress and expansion of the natural gas industry.

THE TULSA CONVENTION

Program Innovations: Full Sessions Draw Hundreds to Annual Natural Gas Meeting

By E. HOLLEY POE Secretary, Natural Gas Section, American Gas Association

ADVANCE registrations have indicated that as this issue goes to press hundreds of men and women identified with the natural gas industry are wending their ways to the Mayo Hotel, Tulsa, Okla., there to be among the delegates when Chairman Thomas R. Weymouth, vice president, Columbia Gas & Electric Corp., calls to order the opening session of the annual convention of the Natural Gas Section of the American Gas Association on May 8, 1939. Members of the convention committees have labored long and well, and the four-day program which is to strike at the heart of the industry's problems will present in addition to a comprehensive general sessions program, meetings devoted to domestic sales, accounting practices, production and transmission subjects, accident prevention, and employe education.

Every effort has been extended by the host companies, the Oklahoma Natural Gas Co., Public Service Co. of Oklahoma and the Central States Power and Light Corp., and, at Bartlesville, Cities Service Gas Co. and C. E. Burlingame Properties, Inc., to provide for the comfort and entertainment of the delegates.

Speaking on the "Activities of the Natural Gas Industry" at the opening general session, Tuesday morning, Mr. Weymouth will set the keynote of the convention. With a background of many years of experience in the natural gas industry, his remarks are expected to be of major interest. Following Mr. Weymouth on the program, Baird H. Markham, director of the American Petroleum Industries Committee, will present a timely and important address on "Business Relationship with Government."

Elmer F. Schmidt, vice-president, Lone Star Gas Co., Dallas, and vice-chairman of the Natural Gas Section, will preside at some of the general sessions.

Wednesday's general session presents Edward R. Guyer, president, Association of Gas Appliance and Equipment Manufacturers, and vice-president, Cribben & Sexton, Chicago; George E. Frazer, counsel, A.G.A.E.M.; Louis Ruthenburg, president, Servel, Inc.; William A. Dougherty, counsel, Standard Oil Company (New Jersey), New York; and Conrad N. Lauer, president, American Gas Association, and president, The Philadelphia Gas Works Company.

In their addresses these speakers will deal with improvements in gas appliances, with the history of business regulation, with problems of management and employe, with recent court rulings in relation to the natural gas industry and, finally, with the great possibilities for further advancement of the industry.

On Thursday, Alexander Forward, managing director, American Gas Association, will tell the convention "What We Have at Headquarters." P. McDonald Biddison, consulting engineer of Dallas, will speak on "Fair Value and Fair Return."

P. C. Lauinger, president of *Oil and Gas Journal*, will show that "Advertising Is Good Business," that it is good not only for cosmetics and tooth paste but also for the whole natural gas industry. Following this address S. E. Whiting, vice-president and chief engineer, Liberty Mutual Insurance Co., Boston, will speak on "Engineering and the Human Equation."

Management Symposium

Five specialists have been selected to present their ideas on the subject of management on Tuesday afternoon. On the agenda are such subjects as "Telling the Story of the Company to the Public," "Engineering Assistance to Management," "Sales Direction in Company Management," "Home Service—The Tool of Management," and "Management — Its Responsibility." The speakers are Will C. Grant, director of public relations, Lone Star Gas Co.; A. W. Ambrose of Cities Service Gas Co., Bartlesville; C. I. Weaver, president of The Ohio Fuel Gas Company, Columbus, Ohio; Jessie McQueen, A.G.A. home service counsellor, New York; and Paul Taylor, vice-president, Stone & Webster Service Corp., New York.

An innovation in the program will be the presentation of prize-winning essays by contest winners. Two subjects—"The Duties of a Local Manager" and "The Duties of a District Manager"—will be covered.

The Accounting Section's session on Monday morning, under the direction of Chairman F. W. Peters, Oklahoma Natural Gas Company, will present "The Effect of the New Classification of Accounts on Natural Gas Production Accounting," by L. L. Dyer, Lone Star Gas Co., Dallas; "Property Reserves" will be discussed by F. B. Flahive, Columbia Gas & Electric Corp., New York; and "Customer Deposits" will be analyzed by Oakah L. Jones, Oklahoma Natural Gas Co., Tulsa.

Summation of "Accounting Section Activities and Organization" will be handled by H. A. Ehrman, chairman, A.G.A. Accounting Section, and assistant to secretary, Consolidated Edison Co., of New York, Inc.

"A Show Will Let Them Know" might well be the slogan of the whole convention, but it happens to be the title of an address to be presented by Harry Swenson of The Peoples Gas Light & Coke Co., Chicago, at the domestic gas sales conference. F. X. Mettenet, chairman, Commercial Section, and vice-president, The Peoples Gas Light & Coke Co., Chicago, will preside.

At this same meeting F. M. Houston, chairman of the Domestic Gas Range Committee, will discuss up-to-the-minute gas appliance advertising, or how the Rangers are riding to a triumphant victory in the CP Range sales.

A workable plan that will enable dealers to secure financing for gas appliance sales will be discussed by

Percy Hall, vice-president of the Manufacturers Trust Co., New York.

Under the leadership of Chairman Mildred Clark, Oklahoma Natural Gas Co., Tulsa, Home Service has the floor on Wednesday afternoon. Such home service leaders as Helen Hatcher, Memphis Power & Light Co., Hulda Ungericht, Ohio Fuel Gas Co., and others have a great many answers to questions that management has not yet asked.

The domestic gas sales conference continues at the Thursday luncheon under the leadership of Joseph Bowes, president, Oklahoma Natural Gas Co. Many new sales promotion ideas will be contained in short talks by W. G. Wiegel, advertising manager, Lone Star Gas Co.; John H. Warden, Oklahoma Natural Gas Co.; R. S. Agee, sales promotion manager, A. G. A. E. M., and Mr. Mettenet. George Rowland, Cities Service Gas Co., Bartlesville, Okla., will lead off the industrial gas sales conference on Monday on the vital point of the "Possibilities and Effects of Oil Industry Loads Upon Gas Company Earnings." M. A. Reagan, United Gas Pipe Line Co., Wichita Falls, Texas, and Frank S. Kelly, Jr., Arkansas Louisiana Gas Co., Shreveport, La., will discuss Mr. Rowland's paper.

W. C. BECKJORD
Speaker

E. F. SCHMIDT
Vice-Chairman

E. HOLLEY POE
Secretary

C. N. LAUER
A. G. A. President

Regarding specific markets for industrial gas, Charles R. Bellamy, chief engineer, Columbia Gas & Electric Corp., New York, will advise, from his vantage point as 1939 chairman of the Industrial and Commercial Air Conditioning Committee, on "Reaching the Summer Air Conditioning Market Through the 1938-39 Developments in Gas Equipment." To add thoughts from the local territories, O. A. Kinzer, Lone Star Gas Co., Dallas, L. O. Vogelsang, San Antonio Public Service Co., San Antonio, and Carl H. Dean, Oklahoma Natural Gas Co., Tulsa, will be on deck.

Another booming natural gas market—gas engines—will be analyzed by D. W. Reeves, Oklahoma Natural Gas Co., Tulsa, and 1939 chairman of the Gas Engine Power Committee. Manley H. Clark, Southern Counties Gas Co., Los Angeles, is scheduled to extend the points in subsequent discussion.

For the industrial gas luncheon address Walter C. Beckjord, vice-president, Columbia Gas & Electric Corp., New York, will interpret how "Management Views the Growing Industrial Gas Load."

Advice on "Approaching Gas Sales from a Salesman's Standpoint Rather Than an Engineer's" will be offered by Charles F. Henness, manager of industrial gas sales, Public Service Co. of Northern Illinois, Chicago. Comment after the formal address will be made by F. Marion Chelf, Public Service Co. of Colorado, Denver; Karl Emmerling, The East Ohio Gas Co., Cleveland; and Edwin Snook, Amarillo Gas Co., Amarillo.

As a wind-up to the session, Frank H. Trembly, Jr., The Philadelphia Gas Works Co., and chairman of the Industrial Gas Section, will outline and evaluate the "Importance of the Industrial Gas Section's Function to the Industry."

J. H. Dunn, general manager, Shamrock Oil and Gas Co., Amarillo, presides over Monday's production conference. C. K. Eilerts and M. A. Shellhardt of the Bureau of Mines, Amarillo, will present new data on "An Equilibrium Cell That Provides a Precision Means of Evaluating the Dew Point of the Mixture of Hydrocarbon Fluids as Produced from Wells."

Of particular interest to production engineers will be "The Feasibility of Recycling Gas from High Pressure Gas Reserves" and "New Uses for Cement in Completing and Reconditioning Gas Wells." The speakers are Jack Vaughn, Tidewater-Seaboard Oil Co., and C. P. Parsons, vice-president, Halliburton Oil Well Cementing Co., Duncan, Okla.

Transmission

Dehydration and resultant effects on carrying capacity, latest developments in pipe coating methods, unusual problems faced in pipe line operation, will be featured topics at the transmission conference during its morning, luncheon and afternoon meeting.

Reginald Burdick, chief engineer, Southern Natural Gas Co., Birmingham, has encountered some unusual problems in pipe line operation which he will discuss at the luncheon meeting. Mechanized equipment for the maintenance of pipe lines will be described by I. W. Wheatley, Cities Service Gas Co., Bartlesville.

John Clark, Hope Natural Gas Co., Clarksburg, W. Va., will present a paper on the "Resultant Effects of Dehydration on Pipe Line Carrying Capacity." Discussion will follow by three men who are specialists in this field: W. M. Deaton, Bureau of Mines, Amarillo; C. L. Brockschmidt, Mississippi River Fuel Corp., and H. H. Ross, Gas Producing Co., Newark, Ohio.

Aubrey Boyd, Lone Star Gas Co., Cayuga, Texas, describes "The Foreman's Place in His Community."

The employee education session, Monday morning, and the accident prevention conference in the afternoon will be presided over by C. L. Hightower, safety director, United Gas Pipe Line Co., Houston. "The Public Liability Problem in Connection with Domestic and Industrial Sales and in the Operation and Maintenance of Mains" will be discussed by L. B. Denning, Jr., vice-president, Community Natural Gas Co.

"The Importance of Investigation of Employe Personal Injury Accidents" closes this session. Problems of who should investigate accidents, methods of investigation, and the investigation of near and minor accidents, are timely subjects to be discussed by R. L. Conway, Jr., United Gas Pipe Line Co., Houston: Hadley Myers, Sinclair Companies, Tulsa; and Robert Huffman, Oklahoma Natural Gas Co., Tulsa.

Not all on the program will be serious. An entertainment series of a group of twelve numbers has been arranged for Wednesday evening in the Hotel's Crystal Ballroom. This will feature a presentation, "All America," by Kathryn Duffy, assisted by the "World's Fairest Glamour Girls." Roy Cowan will be master of ceremonies. Dancing will follow the program.

Chairmen of the various convention committees are: Joseph Bowes, Oklahoma Natural Gas Co. (General Arrangements); Elmer F. Schmidt, Lone Star Gas Co. (Program); Fred W. Peters, Oklahoma Natural Gas Co. (Housing); Carl W. Daniels, Oklahoma Natural Gas Co. (Entertainment); H. V. Potter, Oklahoma Natural Gas Co. (Publicity); and Frank B. Long, Oklahoma Natural Gas Co. (Reception).

Gas Hydrate Formations

A Further Study On Their Prevention and Elimination from Natural Gas Pipe Lines

By E. G. HAMMERSCHMIDT

Texoma Natural Gas Company, Fritch, Texas

• THE ROLE OF GAS HYDRATES in natural gas systems was first reported by Mr. Hammerschmidt, who also discovered the hitherto unknown hydrates of propane and isobutane[2]. This work has been substantially checked by a joint investigation of the United States Bureau of Mines and the American Gas Association, under the supervision of W. M. Deaton and E. M. Frost, who are now continuing the study of gas hydrates and their relation to the operation of natural gas pipe lines.[1]—Editor.

AFTER the cause of freezing in natural gas pipe lines was better understood, gas distribution companies as a whole found that it was desirable to install dehumidification plants on many of their high pressure trunk lines in order to prevent the formation of gas hydrates. For economic reasons, however, there are many cases where a dehumidification plant is not warranted. Such cases as the following might be included in this category: (1) gathering systems, (2) small distribution systems, (3) distribution systems that operate where climatic or pressure conditions induce hydrate formation only at infrequent and short intervals, (4) at points where hydrate formation is concentrated over a small area such as at regulator stations, meter runs, and above ground piping, (5) emergency repairs of main line breaks under adverse surface water conditions. In the above cases it is often inconvenient and sometimes impossible from an operating standpoint to control the formation of gas hydrates by manipulating the temperature or the pressure of the affected gas line. The addition of antifreeze compounds is another alternative that may be employed. Publications regarding the use of antifreeze compounds for preventing hydrate formation are very few indeed. J. T. Russell has described some of the effects of adding ammonia to the gas stream[3]. Alcohol has been used by many gas companies for emergency clearing of lines, but the application of alcohol has usually been a rather haphazard procedure that has met with varying degrees of success. Published data regarding the use of alcohol seem to be entirely lacking. It is obvious that additional information is needed in order to make an intelligent application of the antifreeze method for the solution of gas hydrate problems.

E. G. Hammerschmidt

Law of Freezing Point Depression

If a foreign substance is dissolved in a pure liquid, it will lower the freezing point of the pure liquid a definite amount. The law of freezing point depression states that this depression in freezing point is directly proportional to the weight of dissolved substance in a given amount of solvent. In order to apply this law to the freezing point lowering in gas hydrate systems, it was necessary to determine experimentally a constant for the equation which expresses this law. The constant in the following equation is the average value that was obtained from more than 100 experimental determinations of the freezing point lowering in a gas hydrate system which contained either methanol, ethanol, isopropanol, or ammonia, in concentrations that ranged from 5 to 20 weight per cent of the antifreeze compound.

$$d = \frac{2335\,W}{100M - MW} \quad \ldots \quad (1)$$

Where

d = °F lowering of the freezing point of the gas hydrate.
M = Molecular weight of the antifreeze.
W = Weight per cent antifreeze compound.

Equation (1) is applicable to non-associating compounds such as most organic materials and ammonia. However, a correction must be made for compounds such as acids, bases, and salts because they dissociate when dissolved in water. For example, one molecule of calcium chloride dissociates to form one calcium ion and two chloride ions. In cases of this type, Equation (1) may be corrected in the following manner:

$$Mo = \frac{Mt}{i\,(n-1) + 1} \quad \ldots \quad (2)$$

Where

Mo = Molecular weight, calculated from the freezing point depression.
Mt = Molecular weight from chemical formula.
i = Degree of ionization (dissociation).
n = Number of ions formed from each molecule of the solute.

In the example under consideration, n = 3, Mt = 110.98, and i, the degree of ionization of calcium chloride (obtained from a chemical handbook) is 0.72. Solving Equation (2) we obtain Mo = 45.48. Then, the freezing point lowering d, in Equation (1) may be calculated for calcium chloride solutions by substituting the value of Mo in Equation (2) for M in Equation (1).

Effectiveness of Antifreeze Compounds

The relative effectiveness of various kinds of antifreeze compounds in 10 per cent solutions is shown in Fig. 1. Although ammonia appears to be outstanding in its antifreeze properties, there are many cases where it could not be successfully applied in pipe line operation. The principal reason for this is that most natural gas contains some carbon dioxide. Ammonia will react with carbon dioxide in the presence of water to form a carbonate of ammonia. The carbonates are relatively poor antifreeze compounds. They are also solids which may cause stoppages in the line when the water is evaporated from them. As an example, about 4 tons of ammonia were injected into a 24-in. main line at the

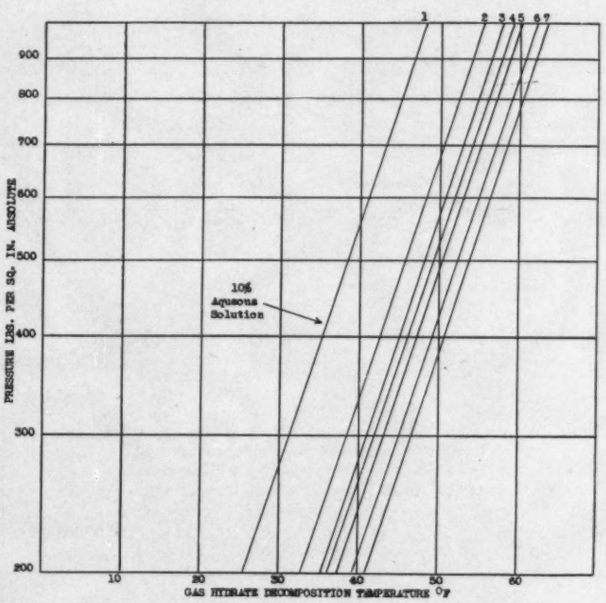
rate of 6 to 9 lbs. per million cu. ft., in an attempt to remove a constriction caused by gas hydrates. Little fluid was removed from the pipe line and yet only 0.7 lbs. of ammonia per million cu. ft. remained in the gas stream at a point 90 miles from the place of injection. Later, large quantities of the solid carbonates of ammonia were removed from the pipe line. The gas in this pipe line contained approximately 0.1 per cent carbon dioxide. The small residue of ammonia in this gas was apparently the amount required for equilibrium conditions with the carbonate mixture in the pipe line. Another disadvantage of ammonia is the fact that aqueous solutions of ammonia are corrosive to brass, with the result that brass after-coolers, valves, regulator parts or other appliances that are constructed of brass are likely to be corroded.

Methanol is an effective antifreeze compound, and it has several desirable properties that make it well suited for use in the control of hydrate formation. It is non-corrosive, it does not react chemically with any constituent of the gas, it is soluble in all proportions with water, it is readily procurable and reasonable in cost, and it is 100 per cent volatile under pipe line conditions, so that a solid residue cannot be deposited if partial or total vaporization of the fluid in the line takes place. Its vapor pressure is greater than water, thereby preventing the deposition of additional moisture such as would occur if a lower vapor pressure fluid were present, e.g. aqueous calcium chloride solutions.

In general, the effectiveness of an antifreeze compound will depend upon its concentration in the liquid phase. The freezing point lowering of gas hydrates in methanol solutions has been calculated from Equation (1) and the results are presented graphically in Fig. 2. (Fig. 2 should be revised when it is to be applied to natural gas systems where the hydrate decomposition temperatures differ from the 0 per cent line.) Since the amount of water and hydrate that may be lying in a pipe line is nearly always unknown, the use of Fig. 2 will have limited application unless some other means can be provided to supply the necessary information for practical application. This additional information is supplied in Fig. 3, which shows the experimentally determined equilibrium conditions between the methanol vapor in the gas stream and the methanol in the fluid at various pressures and temperatures. To illustrate the use of these curves by a specific example, suppose that it is desired to protect or free a pipe line from hydrate formation when the line pressure and temperature are 400 lbs. per sq. in. absolute and 40° F. respectively. Referring to Fig. 2, the required concentration of methanol in the liquid phase at 40° F. and 400 lbs. per sq. in. absolute is found to be 12.5 per cent. Then referring to Fig. 3, the amount of methanol in the vapor phase which is in equilibrium with a 12.5 per cent methanol solution at 40° F. and at 400 lbs. per sq. in. absolute pressure is found to be 20.5 lbs. per million cu. ft. of gas. In other words, if the methanol content of the gas stream is adjusted so that it contains 20.5 lbs. methanol per million cu. ft., the hydrate and water mixture in the line will absorb methanol vapor until the resultant fluid contains 12.5 per cent methanol. Normally, the amount of methanol that is required in the vapor phase for any specific case will be considerably less than the amount of methanol vapor that would be contained in a gas that is saturated with methanol vapor at the same temperature and pressure (Fig. 4).

Practical Applications

If the composition of a univariant system is caused to change, corresponding changes of temperature must ensue. Thus, when ice is added to a solution of salt water, the ice must melt



1. Ammonia (NH_3).
2. Methanol (CH_3OH).
3. Ethanol (C_2H_5OH) and Calcium Chloride ($CaCl_2$).
4. n-Propanol (C_3H_7OH)
5. Ammonium Bicarbonate (NH_4HCO_3).
6. Acetone (CH_3COCH_3).
7. Pure Water.

FIG. 1

Relative effectiveness of various anti-freeze solutions.

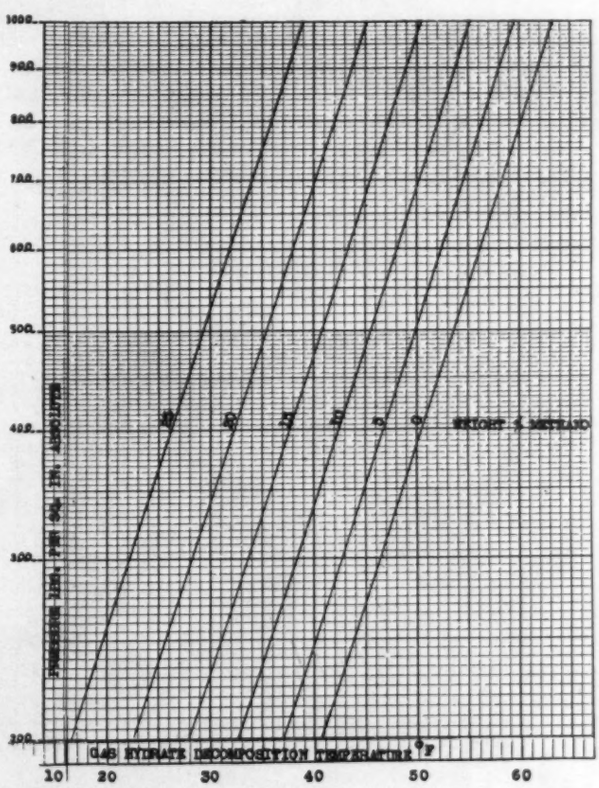


FIG. 2

Freezing point lowering of gas hydrates in Methanol solution.

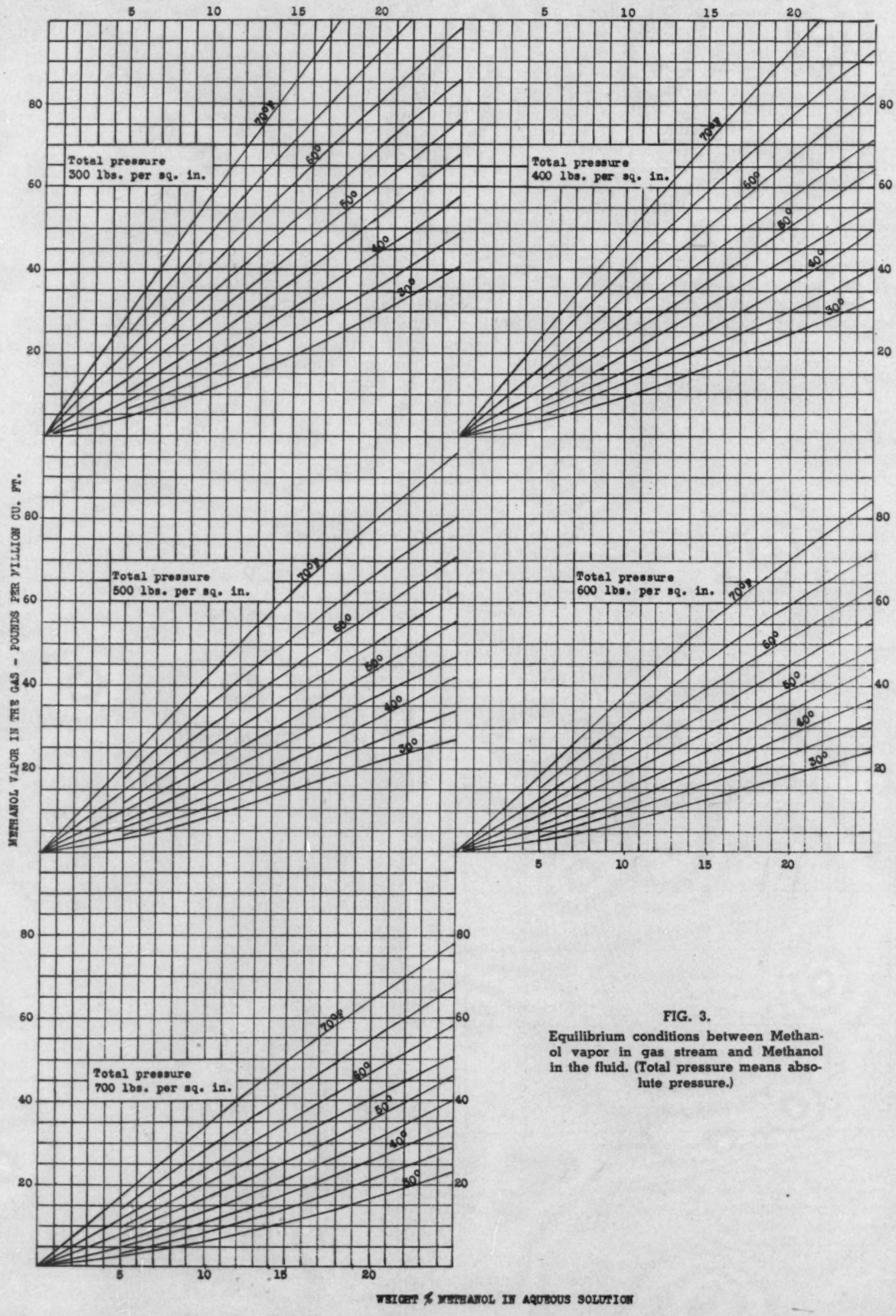


FIG. 3.

Equilibrium conditions between Methanol vapor in gas stream and Methanol in the fluid. (Total pressure means absolute pressure.)

and the temperature must fall. Similar results are obtained when ammonia, alcohol, and other anti-freeze compounds are added to a mixture of ice and water. If this type of cooling takes place within a pipe line, it would cause a lowering in temperature of the hydrate and fluid in the line and hence larger quantities of the antifreeze compound would have to be added in order to melt the hydrate. In order to nullify this cooling effect, full advantage should be taken of the heat of solution and the latent heat of vaporization of the antifreeze compound. When liquid methanol, for example, is mixed with water the evolution of heat amounts to 112 B.t.u. per pound of methanol. Also, when methanol vapor is absorbed in water there is an additional amount of heat evolved equivalent to its latent heat of vaporization, which amounts to 512 B.t.u. per pound of methanol. In order to utilize the latent heat, provision must be made to completely vaporize the antifreeze compound before it reaches the hydrate formation in the pipe line.

Introducing the antifreeze as a vapor into a pipe line which contains flowing gas will usually prove to be much more effective and economical than when it is pumped or lubricated into the line in liquid form. The reason for this is probably due to better and more uniform contact of antifreeze vapor with the hydrate as well as to the heating effect which was described above. As a matter of fact, the introduction of liquid alcohol into a pipe line may fail to produce beneficial results, whereas the introduction of alcohol vapor into the same line and under the same conditions may be entirely successful in removing gas hydrates.

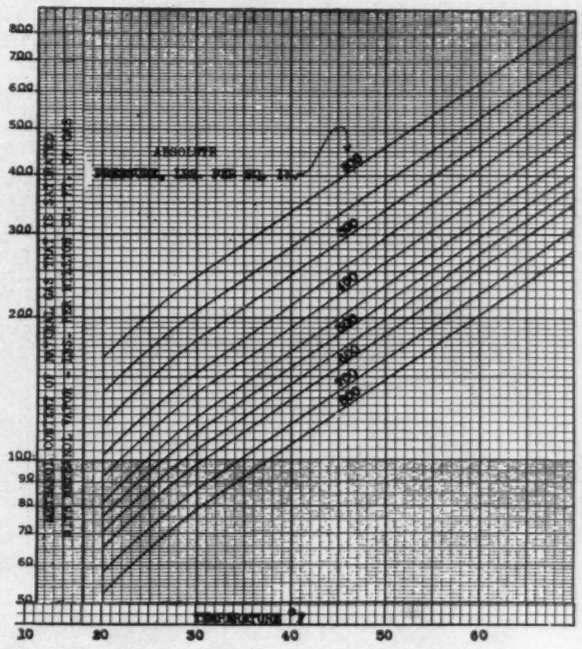


FIG. 4
Methanol required to saturate gas.

An antifreeze compound may be vaporized by atomization as in a spray nozzle. In this case the heat, which is equivalent to its latent heat of vaporization, is absorbed and the vaporized antifreeze compound is thus cooled. Normally this cooling effect will not be harmful because the gas is present in such large amounts, in comparison with the antifreeze compound, that the cooling effect is quickly dissipated. (When the same antifreeze vapors are later absorbed by hydrate formation, the resultant heating effect is not dissipated so rapidly as the cooling effect because of localization of such heating at the points where condensate and hydrate are deposited in the line.) Sometimes conditions may arise when it would be desirable to provide heat at the point of atomization of the antifreeze compound in order to nullify the cooling due to vaporization.

If a pipe line must be operated at full capacity most of the time, it will probably be necessary to provide for continuous injection of an antifreeze compound. On the other hand, if the pipe line is not loaded, it may be possible to reduce the quantity of antifreeze by intermittent injection.

Table No. 1 shows some test data from a 15-in. pipe line that was delivering 1300 Mc.f. per hr. and operating at 325 lbs. per sq. in. absolute pressure with 42° F. ground temperature. Hydrate had formed in a 3.2 mile section of this line, and no fluid could be drained from any of the four drips in this section of the line. On March 2, 17½ gals. of methanol were atomized in this section of the line during a two-hour period. On March 3, 58½ gals. of methanol were added in the same manner during a six-hour period. At the end of the second period of injection, all of the drips were producing fluid—approximately 300 gals. total—and the efficiency of the pipe line increased from 71 to 84 per cent.

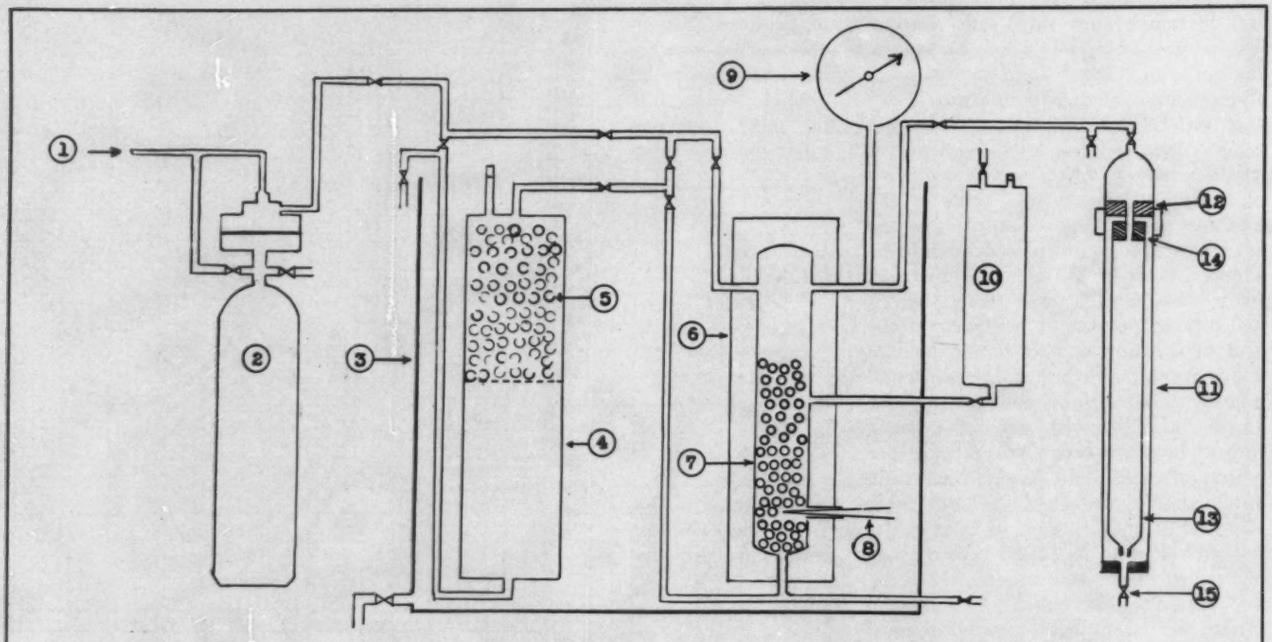
A two-mile section of 10-in. line that was operating at approximately the same temperature and pressure as in the above case, was so badly plugged with hydrates that it caused a pressure

TABLE NO. I. INJECTION OF METHANOL INTO 15-IN. PIPE LINE DELIVERING 1300 M C.F. PER HR. AT 325 LBS. PRESSURE AT 42° F. GROUND ABSOLUTE TEMPERATURE

Date	Time	Distance Downstream From Point of Injection, Feet	Measured Concentration of Methanol in the Liquid, Wt. Per Cent	Calculated Equilibrium Methanol Vapor in the Gas, Lbs. per MM cu. ft.	Approximate Amount of Drip Fluid Removed from Line, Gallons
3-2-39	5:30 P.M.	3833	15.25	31.4	18
3-3-39	8:30 A.M.	6427	9.61	18.7	30
3-3-39	9:00 A.M.	10537	4.83	8.6	5
3-3-39	2:45 P.M.	15275	6.18	11.5	50
3-3-39	3:15 P.M.	3833	14.20	29.3	5
3-3-39	4:45 P.M.	6427	9.13	17.5	10
3-3-39	5:05 P.M.	12293	6.11	11.0	2
3-3-39	5:10 P.M.	15275	7.18	13.5	150
3-3-39	5:20 P.M.	10537	10.86	21.0	------
3-3-39	5:30 P.M.	3833	14.76	30.0	------

Date	Time	Distance Downstream From Point of Injection, Feet	Calculated Equilibrium Liquid, Wt. Per Cent Methanol	Measured Methanol Vapor in the Gas, Lbs. per MM cu. ft.
3-2-39	4:00-5:00 P.M.	17578	6.5	11.73
3-2-39	3:30-5:30 P.M.*	0	19.9	44.9
3-3-39	10 A.M.-4:00 P.M.†	0	21.6	49.8
3-3-39	3:00 P.M.	750	18.0	40.0
3-3-39	3:30 P.M.	17578	8.7	16.9

* 17.5 gals. Methanol injected.
† 58.5 gals. Methanol injected.



1. Gas inlet.
2. Pressure regulator.
3. Constant temp. bath with propane and steam coils and stirring device.
4. Auxiliary saturator tube.
5. Mist extractor.
6. Modified Jerguson liquid level gage, transparent type.
7. Glass bead contractor.
8. Thermocouple.
9. Pressure gage.
10. Liquid injector.
11. ¾ in. steel pipe and union to house absorption tube.
12. Rubber stopper and glass tube in upper half of union.
13. Glass tube for absorbent material.
14. Rubber stopper and glass tube at inlet of absorption tube.
15. Pressure reducing valve, connected to meter with rubber tubing.

FIG. 5. Apparatus for the measurement of alcohol vapors in natural gas.

drop of 140 lbs. per sq. in. The constriction was completely removed after 15 hours injection of methanol at the rate of 10 gals. per hr.

Hydrate formation was prevented in a 2½-mile section of 12-in. pipe line by continuous injection of methanol at the rate of 1.9 gals. per million cu. ft. This line was delivering approximately 26 million cu. ft. per day at a line pressure of 360 lbs. per sq. in. absolute and ground temperature of 46° F. The first drip beyond the point of injection was dry but the remaining seven drips produced fluid each day. The methanol content of the gas was reduced from 1.9 gals. per million cu. ft. at the point of injection to 0.7 gals. at the end of the 2½-mile section.

In the above discussion it has been shown that antifreeze vapors are gradually removed from the gas as it moves downstream. This is due to the absorption of such vapors by moisture or hydrates in the pipe line. Consequently, the concentration of antifreeze vapor will ultimately be decreased to a point where insufficient protection against hydrate formation occurs. In order to determine accurately when this point has been reached, it is desirable to determine by analysis the amount of the antifreeze vapor in the flowing gas at various points along the line. Ammonia vapor may be determined by passing a measured quantity of the gas through an absorption tube which contains a measured amount of standardized acid solution and then back titrating the excess acid with a standardized solution of a base such as sodium hydroxide.

Inasmuch as there was no published method for the measurement of alcohol vapors in natural gas, it was necessary to develop a procedure that could be applied to pipe line conditions. The details of this method are described below, and a diagram of the special details of the apparatus is shown at the extreme right side of Fig. 5. The remainder of Fig. 5 indicates the experimental apparatus that was used to determine the data in Fig. 3 and, with some modifications, it was also used to determine the constant in Equation (1).

Determination of Methanol Vapor in Natural Gas

Methanol vapor may be removed from natural gas by conducting the gaseous mixture through a tube of anhydrous magnesium perchlorate. This product, which is sometimes sold under the trade names "Dehydrite" or "Anhydrone," will be referred to hereinafter as Dehydrite. The Dehydrite, which absorbs all of the methanol, is then dissolved in a standard solution of chromic acid and the amount of absorbed methanol is calculated from the amount of chromic acid that is consumed. Alcohol vapors may be absorbed by the Dehydrite at atmospheric pressure, but much time can be saved if the absorption is made at line pressures.

In Fig. 5, glass tube (13) is 7½ in. in overall length and 0.6 in. inside diameter. A piece of capillary glass tubing ¼-in. in length is sealed to the lower end in order to prevent the Dehydrite from dropping out. Allowing ¾-in. at the top for the rubber stopper, the remaining 6½ in. of the tube will hold approximately 19 grams of Dehydrite. It may be advisable to cover rubber stopper (14) with tinfoil to prevent contact with the Dehydrite. After inserting the filled tube in steel nipple (11) as indicated in the diagram, outlet valve (15) is opened and connected to a meter by means of a rubber tube, and the inlet valve is cracked until a flow of about two cu. ft. per hour is obtained. Outlet valve (15) is then closed until the pressure in (11) becomes equal to full line pressure. The inlet valve is then opened wide and valve (15) is cracked so that the desired flow of gas passes through the meter. The following rates of flow will allow sufficient contact time for

(Continued on Page 94)

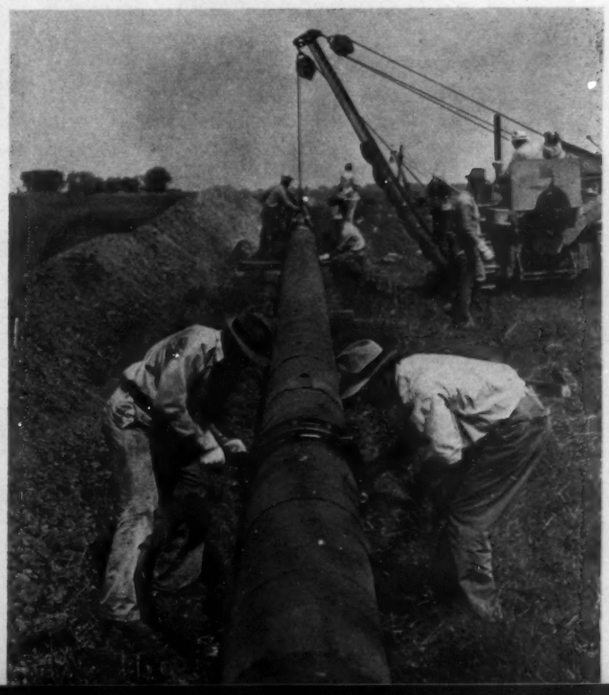
GAS Camera

THE EXECUTIVE BOARD of the A. G. A. made a tour of inspection of the Testing Laboratories in Cleveland, March 29. Dr. F. E. Vandaveer demonstrated research investigations on central heating equipment to the Board members.

CLIFFORD E. PAIGE, deputizing for Hugh Cuthrell, president, Gas Exhibits, Inc., who was ill, turns the valve converting the four pylons of the Court of Flame at the New York World's Fair into gas illuminated pillars of blue, red and yellow flame at the preview and dedication ceremonies, March 31.

A GROUP of delegates (below) to the Southern Gas Association and Southern-Southwestern Regional Gas Sales Conference found the S.S. Rotterdam's sun deck an enjoyable place during the six-day convention cruise, March 19-24. AT RIGHT: E. Holley Poe, secretary, Natural Gas Section, explains the new Federal Natural Gas Act to the delegates.

BELOW: The new 16-in. OD natural gas transmission line built by Northern Natural Gas Company, between Ventura, Iowa, and Albert Lea, Minnesota, has been joined entirely with Dresser couplings.



THE EXHIBIT of the Pacific Gas Radiator Co., Los Angeles, Calif., shows to advantage the company's various models at the gas industry's display at the Golden Gate International Exposition on Treasure Island in San Francisco Bay.

UNITED GAS PIPE LINE COMPANY

Builds a 47-Mile Carrier to Houston

ON THIS page are shown pictures taken during the construction of the 47-mile, 16-in. natural gas pipe line completed late last year by the United Gas Pipe Line Co., Houston, Texas. Purpose of the new transmission line is to carry an added supply of natural gas to the Houston market.

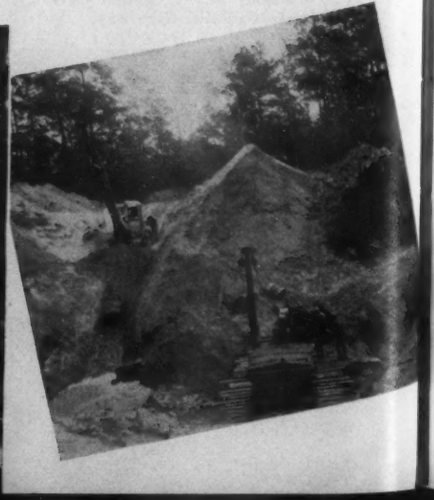
The new line originates in the Katy Field, Texas, runs through the Satsuma and Fairbanks fields to tie-in with the Goodrich-Houston main line at a point 15 miles north of Houston. The line is constructed as follows: three miles of 8-in. lateral lines; 18 miles of 10-in. line; 11 miles of 12-in. line; and 14 miles of 16-in. line. Good weather and favorable soil conditions enabled the project to be completed in 55 days, the work being started on October 4, 1938, and completed in the latter part of November.

Latex Construction Co., Houston, Texas, was the contractor on the project, the welding being sublet to the Shamrock Welding Co., and the coating to the Standard Asbestos Manufacturing and Insulating Co. Phoenix Engineering Corp., Houston, were the consulting engineers.

Part of the pipe line was built of newly manufactured steel pipe furnished by the Youngstown Sheet and Tube Co., while the remainder of the line was composed of second-hand material. The pipe was furnished in 50-ft. sections. The 8-, 10-, and 12-in. lines were welded, while the 16-in. sections of the line were of composite construction (both welded and Dresser coupling). Material furnished by Dresser Manufacturing Co. included 448 16-in. OD style 38 couplings with armored gaskets, plus 147 extra gaskets and 697 extra bolts for an additional 70 couplings. The armored gaskets were supplied with buffed armors to provide cathodic protection to the line.

The line was coated with Barrett's enamel, while the couplings were enameled and covered with a paper known as Hexmesh, manufactured by the Angier Corp., Framingham, Mass. It is pasted to the coupling and pipe with Barrett's compound.

The line is designed for an average working pressure of 350 lbs. per sq. in. and a maximum working pressure of 475 lbs. per sq. in. E. R. Cunningham, superintendent of pipe lines, United Gas Pipe Line Co., Houston, is in charge of the operation of the line.



A STOCK BROKER ANALYZES THE NATURAL GAS INDUSTRY

By JOHN NICKERSON III Partner, Winslow & Douglas, New York City

IN SELECTING a security for a customer, the investment analyst tries to answer two questions about the industry represented by the security. The first is, "Has this industry a proper degree of permanency or security?"

In any investment program, the element of permanency is very important. Suppose a client purchases a security and it goes down in price. If the industry holds its own, theoretically at least, the security will eventually come back to or even surpass the price paid for it.

The second question is almost a corollary of the first, "Has the industry the ability to expand profitably?"

While the proverb, "An industry is born but to die," is subject to a good many interpretations, it is a good one to keep in mind. If an industry year after year loses its customers and increases its expenses, watch out, for however attractive its securities may seem because of high yield or other reasons, it is giving statistical signs of disappearing from the economic horizon.

With these two questions in mind let us look at the natural gas business. But before plunging into present day trends, we must begin at the beginning.

A Speculative Beginning

As we all know the natural gas business had its start amid hectic and wild speculations. The millions of cubic feet wasted through ignorance, through the fond belief that there was no end to the magic supply must cause operators of natural gas properties to grieve even today.

The bible says, "The sins of the father are visited on the children to the third and fourth generation." It is the memory of such profligacy which haunt the minds of the investing public today. As one banker said to me, "What happens when the gas is all gone? You can't spit through a pipe line."

I bring this up for the reason that in my opinion when the natural gas industry wishes to raise equity money through the sale of common stock, it will have to convince the public (1) that it is making every effort to conserve the gas, (2) that new discoveries of gas are more than keeping up with the consumption of gas.

Ralph E. Davis, an engineer high in the regard of the oil and gas business, writes in an article which appeared in *GAS* (June 1938):

"Some three years ago, I had an occasion to estimate the known gas reserves of this country and at that time placed the figure at 62 trillion cu. ft. A similar survey just completed has given a figure of 66 trillion ft. Thus it is seen that new discoveries of natural gas have been in excess of current deliveries and that taken as a whole the gas reserve position of the industry is quite secure."

On the subject of "gas conservation," N. C. McGowen, president of the United Gas Public Service Corp., stated before the Natural Gas Convention held at New Orleans in 1938:

"Conservation of our natural gas reserves and conservation in the production, transmission and utilization of natural gas has been faced positively by your gas association and the gas companies themselves, and the gas industry can pride itself on accomplishments in this regard during the past 10 years. We have encouraged sound conservation policies and have advocated sound conservation laws with proper enforcement. Realizing the importance of proper utilization of gas produced with oil, we recently have been supporting actively studies designed to permit the proper use, in an orderly manner, of more of the gas produced with oil, heretofore blown to the air and wasted."

The present day methods of operating a natural gas company as a producing, transporting and distributing unit may be said to have started in the early 1920's. Up to this time natural gas operations were essentially local situations and performed by many small corporations. This decade saw the formation of such corporations as Cities Service Co., Lone Star Gas Corp., Oklahoma Natural Gas Co., Interstate Gas Co. and others. At the same time the then existing corporations such as Columbia Gas & Electric Corp., Pacific Gas & Electric Co., Pacific Lighting Corp., expanded tremendously. In the South the Moody-Seagraves interests were rapidly building up what was to become the United Public Service Co. system. Certain of the oil companies (particularly Standard Oil of New Jersey) developed such properties as the Peoples Natural Gas Co. and the Hope Natural Gas Co. The year 1929 arrived with the natural gas companies expanding as fast as they physically could.

The year 1930 came and went with the country still hopeful that conditions of prosperity would return; 1931 came and went with hope beginning to go. With 1932 came a dull fear called depression that engulfed the country like a tidal wave.

What happened to this comparatively new industry called natural gas? Did it have that investment element called "permanency"? During a period of unprecedented deflation plus extraordinary rate cuts, only three important companies constituting about four per cent of the gross of the entire industry were forced to the wall.

At the Bottom, a Rise

From an operating standpoint even during this period of depression, the answer to our second question is given. In 1929 total customers using natural gas were 5,848,000. In 1932, the low point of the depression, total customers had risen to 6,082,000, an increase of 234,000.

If this business can increase during a time of deflation, it should increase during a period of comparative prosperity. And so it proved.

From 1932 to 1937 the number of customers had risen to 7,006,000, an increase of 924,000 or 15 per cent. During this same period, gross revenues went from $340,000,000 to $441,000,000, an increase of nearly 30 per cent. Net income rose from $43,000,000 to $74,000,000, an in-

crease of 72 per cent. These figures make pleasant music to an investor's ear.

But looking for the most part into holding company reports is a story of a development of an industry within an industry which is as amazing as any development occurring in the 1920's, namely, the high pressure, long distance natural gas transmission company. These companies sell only at wholesale to other utilities or to large industrial companies.

It appears as if the first bonafide wholesale long distance natural gas transmission line was the formation of the Colorado Interstate Gas Co. in 1927. This was for the purpose of transporting gas from Clayton, N. M. to Denver, Colo., a distance of 350 miles. In quick succession came Mississippi River Fuel Gas Co. (Louisiana to St. Louis—450 miles); El Paso Natural Gas Co. (Texas to Phoenix, Ariz. —200 miles); Southern Natural Gas (Louisiana to Macon, Ga. — 462 miles); Natural Gas Pipe Line of America (Oklahoma to Illinois—950 miles); Northern Natural Gas Co. (Oklahoma to Minneapolis, Minn.—960 miles); Panhandle Eastern Pipe Line Co. (Texas to border of Indiana —850 miles).

By 1933 these long distance pipe lines were in full operation with the exception of Panhandle which had not yet tied in with Detroit. In this year the total gross revenues of the five leading long distance pipe lines was approximately $25,000,000 with a net loss of over $3,000,000. In 1937, the total gross revenues had risen to $57,000,000 with a net profit of $17,000,000.

Holding Companies Did It

It is a commentary on the times that the holding company which is the political scapegoat of the day quietly and unobtrusively financed and built a whole new industry during the depression, a time when jobs and money to finance them were as nuggets of gold.

This same political force which is relentlessly pursuing "big business" and other reasons such as necessity for additional financing, due to inevitable extension programs, will eventually oblige the transmission companies to look to the investing public for the necessary financing. The common stock of El Paso Natural Gas Co. and Southern Natural Gas Corp. are available in the security markets. Indirectly, Colorado Interstate Gas Co. and Natural Gas Pipe Line Co. of America (the Chicago line) may be purchased by buying Mission Oil Co. stock. In the same way an interest in Panhandle Eastern Pipe Line Co. may be acquired through Missouri-Kansas Pipe Line stock.

The year 1938 was a second test of the natural gas companies. On top of a spectacularly warm winter, industrial consumption was far from normal due to the inert year of 1938. But again the natural gas companies acquitted themselves very creditably. In nine important producing and distributing companies the gross income for the year 1938 was off six per cent and net income off 27 per cent. These two percentage figures are exaggerated because one of the companies which is included in the above tabulation gets a good percentage of its gross from the oil business which was very adversely hit during the past year.

Efficient Management

Examining the annual reports of the important companies, one is impressed that without exception, expenses are being held in line with gross income.

A good example of efficient management may be found in the 1938 annual report of the Peoples Gas, Light & Coke Co., an important distributor of natural gas:

"Operating expenses exclusive of the item of taxes, were $911,010 less than in 1937. Decreased expenditures for gas purchased and produced, due to reduced sales, accounted for the principal reduction in operating expenses. Unaccounted for losses were less both in volume and percentage send-out, than in 1931, and this was also partly responsible for the decreased expenditures for gas."

Another encouraging sign is that the managements are taking advantage of the current money market to refund all fixed income obligations on a more favorable basis wherever possible. Note may be made also of the attempt of some of the companies to space their bond maturities so that the whole funded debt may not fall due in any one year and also to provide for debt retirement by adequate sinking funds.

An interesting statement appears in the Lone Star Gas 1938 annual report:

"During the current year conditions surrounding the security markets were more favorable than in past years, and your directors decided that the best interest of stockholders would be served by refinancing all outstanding bonds, bank loan notes and preferred stocks of your corporation and subsidiary companies, provided new securities could be issued on a basis favorable to the Lone Star group. . . . Negotiations with underwriters and bankers indicated that new securities could be issued on a basis that would reduce the annual carrying charges, and provide for uniform maturities over a period of years, thereby avoiding the requirement of providing for peak maturities in later years."

Best of all, the customers of the natural gas companies are increasing. In practically every company, the rate of increase runs from three to five per cent over 1937. This fact indicates that the industry is alive and growing. It seems safe to assume that if the companies can get business during hard times, they can get a lot more business in good times with attendant profits to those that invest in their securities.

On this subject the annual report of the Oklahoma Natural Gas Co. states:

"Continuation of the construction of new homes is evidenced by the fact that the company has gained 5860 new customers during the year. . . . The addition of these new customers during the year and 16,182 during the past three years is a good indication of the stability and growth of the territory served."

A Look to the Future

Last, but not least, the annual reports of the different companies indicate that the managements realize the necessity of finding new supplies of gas and conserving those that they have. I quote from the 1938 annual report of the Pacific Lighting Co.:

"A deeper zone and extension were proved in the Kettleman North Dome field which is one of the most productive of the world's known oil and gas supplies. Four new fields were discovered in the San Joaquin Valley, in one of which the discovery well was drilled to slightly over 15,000 ft. bringing in the deepest zone in this area and opening up the possibility of new lower zones in existing valley fields. . . . It is estimated that of all gas produced in the state (California) in 1938, 90.3 per cent was delivered to pipe line systems serving gas customers, or utilized by oil and gas producing companies. This reflects an increase in unconserved gas due largely to the first flush production of new discoveries, and therefore may hoped to be temporary."

No financial discussion, or in fact any treatise on any subject whether it be economic, social or political is complete without some pointed reference to the constant increase of taxes. I could give figures on the amount of gross and net consumed in taxes, but they have been read in a thousand

(Continued on Page 43)

Controlling Excessive Pressure Conditions In a Distribution System with Differential and Time-Temperature Pressure Regulators

By GILBERT ESTILL Superintendent, Gas Measurement Department, Oklahoma Natural Gas Company

SINCE the amount of gas lost by leakage without a gas distribution system varies directly with the gage pressure carried, it is easily seen that any reduction in pressure will reflect itself in a reduction of "unaccounted for" gas.

In the operation of a distribution system using manually adjusted regulators, it is impossible to prevent more or less excessive pressure conditions throughout a considerable portion of the year. Rapidly changing weather conditions are responsible for peaks and valleys of demand which can be cared for only by providing sufficient pressure for maximum demands. This causes excessive pressure to exist at periods of low demand, and, during a 24-hour cycle, these valleys are far in excess of their corresponding peaks.

With the idea in mind of correcting this condition, automatic pressure controls were installed in the city of El Reno, Okla.

El Reno has approximately 2,754 meters and is served through a medium pressure belt line of 2-, 3-, 4- and 6-in. pipe. The demand on this medium pressure system is very heavy at times, due to industrial consumers who are supplied from the medium pressure system. The industrial load is not a constant load, but is a widely fluctuating one serving a roundhouse for the preheating of locomotives. It is impossible to know at what time this demand will be made, therefore, it is either necessary to carry a higher medium pressure than is needed the greater part of the day, or have some one on duty to boost the pressure when this demand occurs. In order to compete with this unusual occurrence, there has been installed at the City Border measuring and reducing station, a Fisher-King Booster, which allows a minimum pressure to be carried during the off-peak hours and adequately boosts the pressure as load demands increase.

The purpose of this booster is to increase automatically the discharge or reduced pressure in accordance with the load demand in the medium pressure system. This pressure control maintains a constant reduced pressure at the low point in the distribution system. To do this, an orifice plate is installed in the pipe line on the down stream side of the regulator, with up-stream and down-stream pressure taps. In this pressure boosting device, the up-stream orifice tap is connected to the bottom side of the pressure-boosting diaphragm. The down-stream orifice tap leads to the upper side of the boosting diaphragm. When there is a greater demand for gas in the system, the orifice creates an increase in the differential pressure. The pressure in the lower diaphragm compartment being higher than in the upper diapragm compartment, the booster diaphragm moves upward, compressing a spring and creating a force on the lever arm, thus causing its free end to be forced downward, transmitting this force against the reduced pressure applied to the underside of the pilot diaphragm. This gives a new and greater pressure setting to the loading or pilot regulator over and above its base setting adjustment, which was made at the time of installation. As the pilot loading regulator receives its additional force through the booster diaphragm it opens wider, allowing a greater amount of pressure in the upper diaphragm compartment of the main regulator, forcing the main diaphragm downward, opening the main inner valve, and allowing a greater flow of gas into the medium pressure system. The reduced pressure or down-stream orifice connection is connected to the bottom side of the main diaphragm chamber, and in turn to the lower side of the bottom diaphragm in the pressure loading pilot. There is also a fixed bleed orifice from the upper side of the main diaphragm chamber. This allows a small amount of gas to bleed out of the high pressure chamber into the main reduced pressure system. This leakage is never sufficient to cause an excess pressure in the reduced pressure system.

By this method of operation, the Fisher King-Booster increases or de-

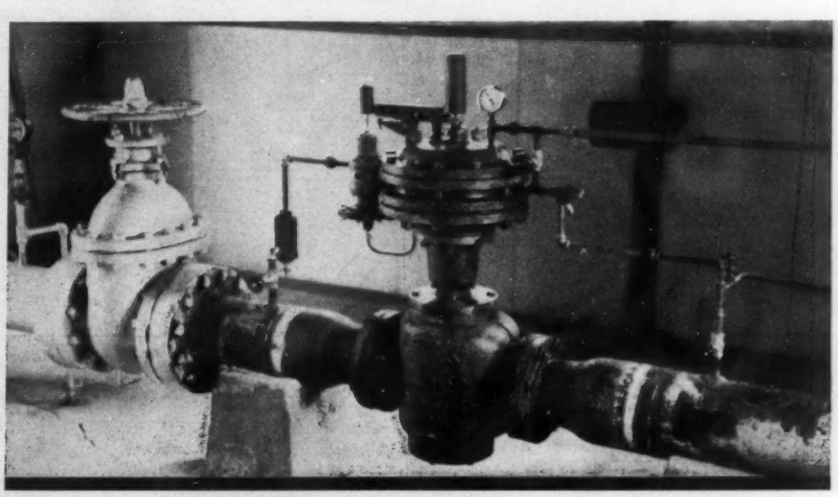


FIG. 1. Booster installation at City Border Regulator Station.

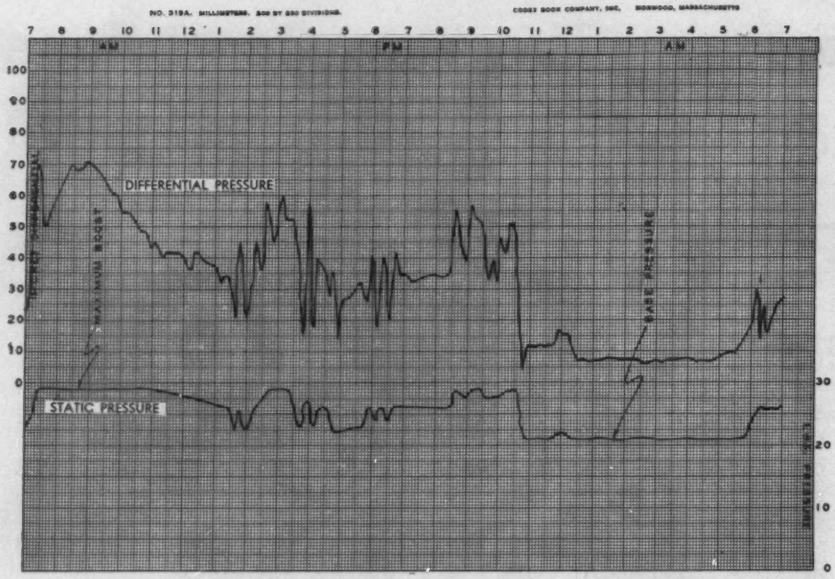


FIG. 2. Instantaneous comparison of differential to static pressure. City Border Regulator Station, El Reno, Okla.

creases the amount of intermediate pressure directly in relation to the differential across the orifice plate or in relation to the demand for gas from the intermediate system.

Fig. 1 is a photograph of the Fisher-King Booster installation in the City Border regulator station in El Reno. Fig. 2 is a curve of the actual 24-hour static pressure, compared with the differential pressure, as taken from City Border charts.

The 2,754 residential consumers in this system are served from the low pressure line through five district regulators with a severe demand on them during the heating season, and a rather low demand during the warm weather. As practically all the fuel used for heating in El Reno is gas, it has been noted that load demands on the cold days vary directly with the decrease in atmospheric temperature below 64° F. Taking into consideration that it is very difficult to get several velocity type boosting regulators to work in a distribution system without robbing from one another, there has been installed on each of the district regulators thermostatic pressure boosters, which boost the reduced pressure directly proportional to atmospheric temperatures below 65° F.

By setting the thermostatic boosters at a minimum base pressure for temperatures above 65° F. and increasing the reduced pressure as the temperature decreases below this point, it is possible to provide a sufficient pressure to meet the maximum requirements without any unnecessary excess.

Regardless of temperature, there is no demand for the boosted pressure during the major portion of the night, as normally provided by the thermostatic boosters; therefore, there is in addition a clock operated time control which automatically places the thermostatic booster in or out of control at predetermined times. During the off or night period a constant low pressure of a desired value may be maintained.

Fig. 3 shows a sectional view of this type of thermostatic pressure booster. This booster is composed of four separate units which are the main valve, auxiliary loading regulator with temperature booster element, maximum boost limit regulator, and time pressure control.

The main valve is of the conventional double ported type of pressure balanced district regulator incorporating a fully balanced inner valve with composition valve seat discs which seat against raised face valve seats. The inner valve is connected to a large area diaphragm by a valve stem working through a loose fitting and lubricating seal in the bottom of the bottom diaphragm casing. Diaphragm heads are provided on both sides of the diaphragm to support the pressures applied on both sides of this diaphragm. Down-stream or reduced pressure in ounces is applied to the underside of the diaphragm producing a force always tending to close the inner valve. From the top side of the diaphragm

(Continued on Page 46)

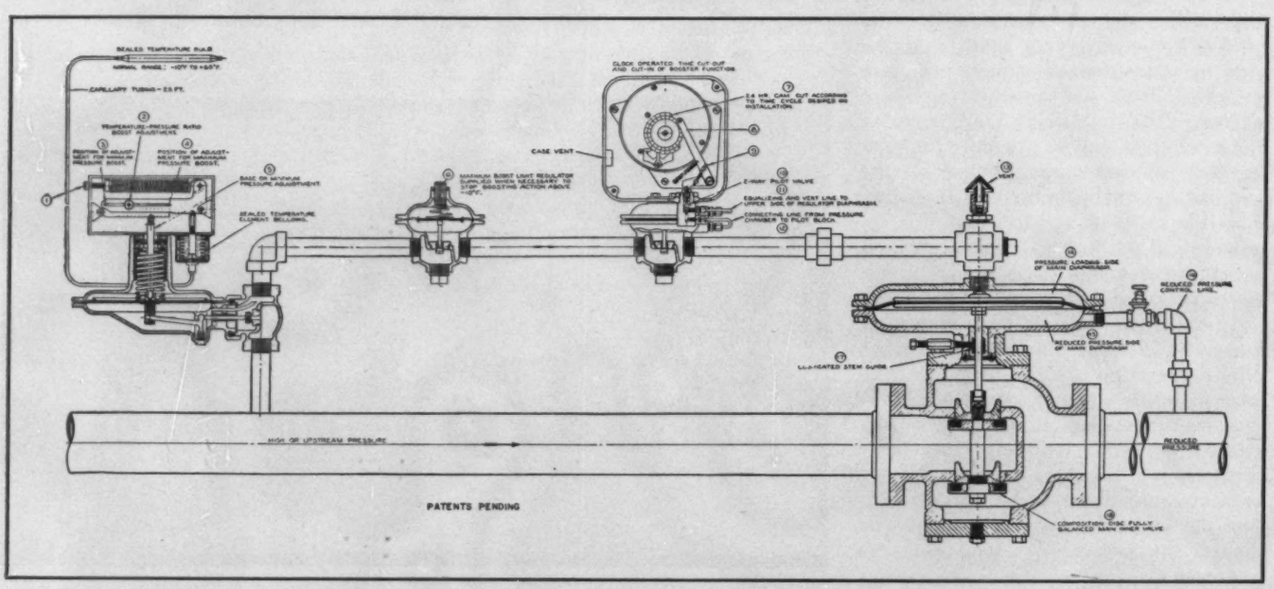


FIG. 3. Diagram of the thermostatic pressure booster.

Gas Flow Through Compressor Plant Suction and Discharge Piping

• JOHN ROGERS, chief engineer, Oil Field Dept., Ingersoll-Rand Co., Los Angeles, Calif., and Phillipsburg, N. J., in a paper, "Characteristics of Gas Flow Through Compressor Plant Suction and Discharge Piping," presented before the Spring Technical Conference of the Pacific Coast Gas Association, Los Angeles, Calif., March 23 and 24, 1939.—(Abstract by G A S).

DURING the past few years designs for compressors have changed materially. These changes have necessitated a closer study of the relationship between plant piping and its effect upon the compressor operation.

Most engineers use average velocity when designing intake and discharge piping, therefore the object of this paper is to acquaint designers and operators with the fact that the design of inlet and discharge piping in a plant has a very definite effect on economical operation, more so than has been recognized in the average installation.

In the design of the pipe line to and from the plant, there is a great deal of available data, but for the inside piping very little mathematical investigation has been made or practical formulæ developed.

With the exception of a few plants which use centrifugal type compressors, the units are reciprocating, and for this reason set up pulsating flow in the lines. The intensity of the original impulse of the reciprocating piston in the discharge piping depends upon the diameter of the piston, piston speed, the discharge volume in the chambers adjacent to the cylinder and the discharge pipe, the discharge pipe length and the density or pressure of the gas handled. The same thing is true applied to the inlet piping.

Single Unit Installation

The single unit installations have several known characteristics, based on shop tests. Plant piping can be designed with reasonable assurance around the single unit, but with two or more of these units in parallel, complications are likely to develop in the suction and discharge piping.

The velocity at which the pressure wave travels in the inlet or discharge line seems to be questionable. There are many opinions, but at any rate the cycle of pressure from high to low and back again is greatly affected by the size and length of the inlet and discharge piping adjacent to the compressor.

The design of the piping, for maximum efficiency of compressors, becomes also a problem of tuning, or breaking up of pressure waves as they develop in order to maintain a one-way conservative velocity. If the tuning of the system is such that a return wave meets an outgoing impulse at the valve, the head pressure will be exceedingly high; but if a number of these waves are in step it is found, by the indicator, many problems are to be solved.

In the average plant, pressure readings are the ones that appear on the log, and are the ones that are usually used for checking the plant capacity. For example, take a plant with the indicated pressures as desired, the intake manometer and the low pressure discharge gages steady, the plant appears to be operating efficiently until a check is made on overall capacity. With conditions as stated it is often found the plant capacity is below its rating.

An explanation of these apparently inconsistent results is found in the following illustrations:

Card No. 1 shows a pull card taken from the compressor headers in a plant consisting of a number of units with hook-up as shown in Fig. 1. This card is representative of like cards made in the average plant. Line "a" on the card represents a steady gage pressure at the discharge pipe line coming from the compressor, i.e., a steady average discharge pressure through the medium of a dampener cock in the line. Line "b" is the atmosphere line and line "c" the intake line.

By putting a sensitive indicator on one of the compressors, with a hook-up as shown in Fig. 2, a very different picture of what is going on in the discharge line is obtained. The result is illustrated in Card No. 2, where the effect of the discharge wave on the pressure within the compressor cylinder is also shown.

It was not possible on Card No. 1 to follow the action of the pressure wave in the pipe line because of the dampening effect of cock or chamber ahead of the gage, or because of its remoteness from the compressor cylinder. But by installing the indicator on a cylinder and its adjacent piping and using a hook-up as shown in Fig. 2, it is possible to get another and a very different picture. The gage board still may read 35 lbs., but due to tuning or pulsation one obtains Card No. 3. Continuing the investigation to complete the picture, Card No. 4 is obtained by changing to another cylinder on another parallel compressor, while at the same time making a pull card from any one of the low pressure cylinders the result of which is shown on Card No. 5. Looking at the lower portion of the cards it is also found that there is something taking place on the intake line. In trying to analyze with indicator cards of this sort, almost anything in final plant results can be imagined.

Card No. 6

Studying Card No. 6 which is a repeat card taken from Cylinder No. 1, the portion of the card above the discharge line "a" is called overhead. The valve area and velocity in this cylinder had been checked and found correct according to good practice. The overhead in the cylinder is evidently caused by inertia or pulsation

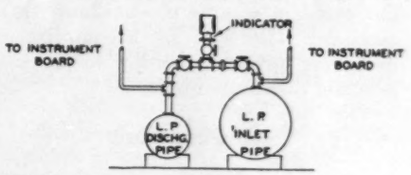


FIG. 1.

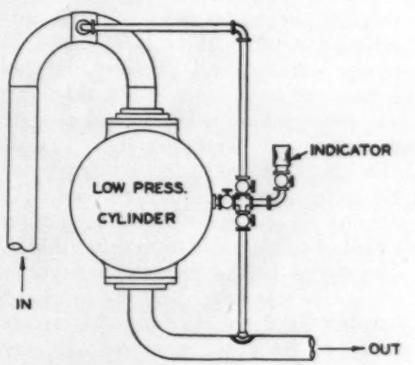
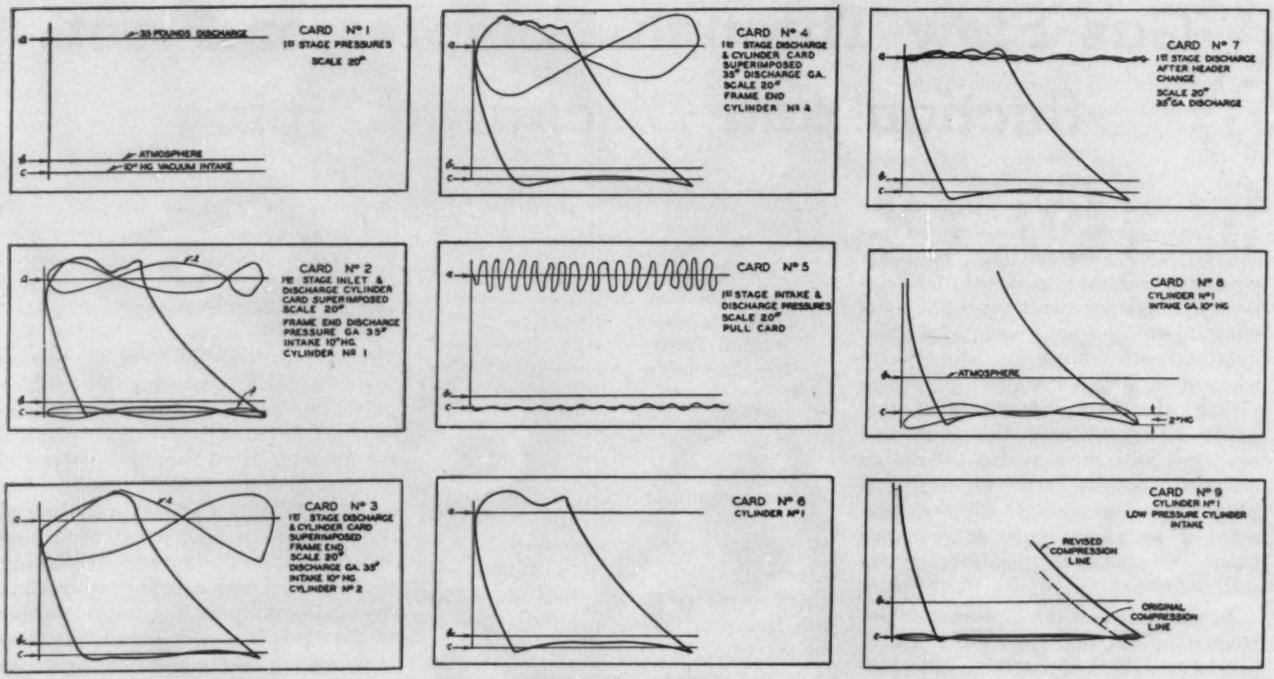


FIG. 2.



from pressure waves in the line—it closely follows the discharge pipe indicator which is taken just beyond the discharge flange and clearly illustrated on Card No. 2. Card No. 3 on No. 2 Cylinder also shows that there is pulsation in the discharge pipe close to the cylinder and even reaching back into the cylinder. Card No. 6 shows the next effect of this surge in the pipe line, amounting to 15 per cent excess horsepower, obtained by using the ratio of the shaded area to total area of card. For the operator, the problem is how to cut down this overhead. This can be accomplished by giving proper attention to the intake and discharge lines.

Tracing the Flow

Tracing the flow, the gas first enters the discharge chamber, and if this area is sufficiently large to offer little resistance, the gas can easily get away. It then enters the discharge pipe through the outlet flange. If the outlet pipe is large, there is a chance of excess velocity and pressure, but as it happens in so many cases, economy has dictated the installation of a small discharge line. Then too, there is usually quite a distance from the cylinder flange to the main header and this column of gas must be set in motion ahead of the impulse from the cylinder. The energy used getting this column in motion is represented by the overhead area in Card No. 6. Once this excess pressure wave is generated, it may carry on through into the main header, in fact, subsequent tests indicate this condition actually existed. One compressor of a group in parallel may even be shut down and still obtain the wave on the pull card, but of less intensity. A portion of the excess is caused by the wave from one cylinder meeting the wave from another, compounding the pressure and energy shown on the card. Usually there is ample horsepower to take care of this overhead, but if it can be eliminated, considerable saving should materialize.

In the case described, it was possible to replace the small discharge pipe with a small receiver header as shown in Fig. 3, with a net result that when subsequent indicator cards were taken and results checked, they are as shown on Card No. 7.

From this check a decided improvement can be seen in the flow and the resultant lowering of the net overhead. Additional improvement in quieter operation of the unit itself and lower temperatures in the discharge gas were noted.

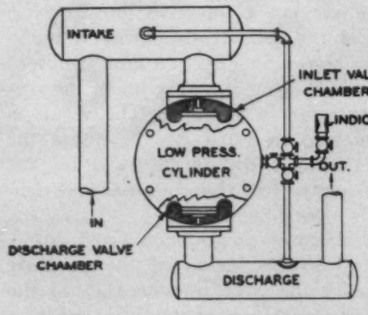


FIG. 3.

In tests made of the action of the gas in the discharge lines of the higher compression stages similar results were found but relatively more pronounced due to the increased density. In many high pressure plants this wave action reaches the proportion of a hydraulic problem identified by pipe and valve "hammer" similar to liquid noises.

Wave Action Found

It had been previously noted that some wave action was found on intake line (illustrated on Cards No. 2 and 5). Investigating the intake, the plant capacity was found to be out of line when checked against the meter and factory test. At the factory this particular cylinder combination had passed over the test pits, was checked by inspectors for volumetric efficiency and valve area and was found correct.

Pursuing the study of the indicator cards and referring back to the original pull cards taken from the headers, it is found that if one gets far enough away from the compressor and use dampeners, a straight line on the intake header is obtained. However, in referring to Card No. 8 which is a composite of Card No. 1, a card from the intake and a card from the cylinder, taken with a hook-up shown in Fig. 2 all on an enlarged scale, an indication of the existence of a pressure wave on the intake pipe is evident.

It is found by Card No. 8 that there is actually a negative wave at the end of the compressor stroke. In other words, at this point the real intake available is 12 in. Hg., instead of 10

in. Hg., shown on the gage board manometer; consequently the piston starts to compress from this point with a proportionate loss in volume in a ratio of absolute pressures or a net volume loss of better than 10 per cent.

Here again is a problem of inertia and time lag, of getting a column of gas in motion without wasteful loss of energy, with a resultant loss of capacity. The same corrective measures used in the case of the discharge piping was used on the intake piping, i.e., putting a surge chamber or enlargement in the inlet line to break up the pulsation. Adding this chamber to the inlet a normal Card No. 9 is obtained.

It so happens that the installation as originally piped was susceptible to accentuated pulsation on change of speed. The problem then was to design or change the piping so that pressure waves were broken up at the source, and the pulsation due to the reciprocating motion or wave is converted into the stream line or average flow as close to compressor as possible with the least possible loss in horsepower and capacity.

In cases such as this, experimenting with volume chambers above the discharge valves close to the compressors, it is possible to convert the pulsations into stream line flow before the reduced pressure gets far from the compressor and in communication with waves from other machines. It makes the load easier on the engine governor because engines operate with less speed variations.

Regardless of how good the valve or general compressor design happens to be, the pipe line design can nullify these factors. However, good compressor design does not stop at the inlet and discharge valves. The discharge chamber in the compressor cylinder should be considered as a part of the discharge line and taken into consideration when designing to eliminate the effect of pressure waves and their consequent losses.

By analyzing Cards No. 2, 3 and 4, the advisability of installing the surge chambers mentioned is indicated to prevent the building up of velocities and abrupt pressure changes just outside the compressor valves. With the aid of this change, the conditions shown in Cards No. 7 and 9 with regard to discharge and intake respectively, are effected as a result of smoothing out the pulsating flow to a point where the main header can be designed economically and according to the best practice used in pipe lines.

It must be recognized that all gas has weight and the higher the operating pressure the more weight per cu. ft., consequently the more important it is to recognize and deal with pulsation at the source. Since gas is compressible, it is not as difficult to deal with as a liquid, but in the main, gas in its flow follows the same laws, therefore the use of straightening vanes, elimination of elbows, reduction of high velocities and the installation of surge chambers are the principal remedies to be considered where pressure wave difficulties are found.

Elimination of surges in both inlet and discharge piping affect the economy by decreasing horsepower (overhead) and increasing capacity.

Other methods have been used to accomplish the same result, for example: an orifice plate can often be resorted to when undue pulsations are built up, but this generally results in a loss of power due to pressure drop. Change of speed some times may help this pulsation flow loss since it may convert the wave frequency into a more useful phase, but it is not a flexible or permanent correction.

A simple method to use if it is desired to check the peak pulsation, is to attach an O'Kill pressure indicator. This will not time the pulsation, but will indicate if there is an abnormal condition in the lines and its magnitude. The Cathode Ray Oscillograph seems to be a practical medium for the detection of photograph lines of pressure waves in high speed units, since the standard indicator is not sensitive enough and the effect of weight of parts mislead many investigators of this problem. The centrifugal or rotary type compressor might also produce a pulsating harmonic which would be difficult to control especially when working on light load. Therefore, all that has been said on this subject might be amplified to include all types of gas compressors.

It is the writer's opinion that much research can be directed to a good end in the field of plant piping as long as there is possibility of pulsating flow in the handling of gas.

CALENDAR

May

Association of Gas Appliance and Equipment Manufacturers—Annual convention, Roosevelt Hotel, New York City, May 24-26.

Executive Conference, A.G.A. — Fairmont Hotel, San Francisco, May 15-16.

Hotel, Restaurant and Commercial Sales Conference, A.G.A. — Hotel St. George, Brooklyn, N. Y., May 22-23.

Indiana Gas Association, Annual Meeting—Fort Wayne, Ind., May 8-9.

Natural Gas Section, A.G.A.—Annual meeting, Mayo Hotel, Tulsa, Okla., May 8-11.

New England Gas Association, Operating Division — Hotel Bond, Hartford, Conn., May 12.

Operating Division, New England Gas Association—Hotel Statler, Boston, Mass., May 12.

Pennsylvania Gas Association Annual Convention—Sky Top Club, Sky Top, Pa., May 2-4.

Production and Chemical Committees Conference, Technical Section, A.G.A.—Rochester, N. Y., May 22-24.

June

American Home Economics Association Convention—Gunther Hotel, San Antonio, Texas, June 19-22.

Canadian Gas Association—32nd Annual Convention, Royal Connaught Hotel, Hamilton, Ontario, June 6-7.

Empire State Gas & Electric Association Group Meeting—Tower Club, Park Central Hotel, New York City, June 9.

Michigan Gas Association — Annual Convention, Grand Hotel, Mackinac Island, Mich., June 29, 30, July 1.

Natural Gas and Petroleum Association of Canada Convention—General Brock Hotel, Niagara Falls, Ont., June 1-2.

Public Utility Advertising Association—Annual Convention, New York City, June 18-22.

Regional Sales Conference, Commercial Section of New York and New Jersey—Hotel New Yorker, New York City, June 1-2.

August

American Dietetic Association—Ambassador Hotel, Los Angeles, August 28-31.

Appalachian Gas Measurement Short Course—University of W. Va., Morgantown, W. Va., August 21-23.

National Association of Railroad and Utilities Commissioners—Seattle, Wash., August 23-25.

September

Gas Industry Day—Golden Gate Exposition, San Francisco, September 9.

Pacific Coast Gas Association—46th Annual Convention, Fairmont Hotel, San Francisco, Calif., week of September 4.

October

American Gas Association—21st Annual Convention, New York City, week of October 9.

Gas Industry Day—New York World's Fair, October 9.

National Metal Congress and Exposition—Chicago, October 23.

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A Stock Broker Analyzes The Natural Gas Industry

(Continued from Page 38)

places elsewhere. If anyone, however, is curious enough to read an excellent analysis of the piercing, grinding, crunching, choking burden of taxes, which is bound to descend on this industry unless the present increase in taxes is stopped, I recommend he read the annual report of the Consolidated Edison Co. of New York. I am sure the company will send it to him on request.

To sum up, in my opinion the natural gas industry has given the lie to the oft-repeated statement that opportunity no longer knocks. It has answered in the affirmative the two questions which go through a stock broker's mind, namely, is the business permanent and is the business growing? From an investment point of view, ample yields are obtainable plus a large measure of possible appreciation for those investors who will study the securities of America's newest national industry, natural gas.

Measuring Earth Potentials With a Copper Electrode

A COPPER electrode in a saturated solution of copper sulfate has been widely used as a reference half-cell in measuring potential differences in the earth, contact between the ground and the copper-sulfate solution being made through a porous material (1) (2) (3). However, certain peculiarities in the behavior of this electrode, such as very high resistance in the porous medium and relatively large variations in potential without assignable cause have been reported. The purpose of this investigation was to determine the reasons for this behavior so that faults can be eliminated in the design of the half-cell and proper corrections can be made for variations in its potential.

SCOTT EWING

The following conclusions were arrived at:

1. Electrolytic copper electrodes, annealed, cleaned, and aged in a copper sulfate solution containing a small percentage of sulfuric acid, will give reproducible potentials with respect to a copper sulfate solution within about 1.5 mv.

2. Plating the electrodes with spongy copper at high current density will increase the reproducibility to within 0.2 mv.

3. Any contamination of the copper sulfate solution which is likely to occur in practice will have a negligible effect on the potential of the half-cell.

4. The effect of temperature on the potential of the unsaturated and saturated half-cell has been determined. Errors remaining after correcting for temperature of the half-cell will depend on field conditions but are not likely to exceed 2 mv.

5. Potentials as great as 4 mv have been observed between pairs of electrodes, one of which is in contact with highly acid soil and the other in contact with highly alkaline soil. Since this extreme range in pH (3 to 10) is not likely to occur in adjacent soils, the effect arising from difference in acidity is not likely to exceed 2 mv. However, in the field measurements some uncertainty is likely to be encountered because of differences in soil properties.

6. Polarization on the copper electrodes has probably been the principal source of error in many field measurements. The error from this source will not be appreciable if the potential measurements are made with a potentiometer or similar device. When an indicating instrument is used, polarization errors can be reduced below 2 mv by the use of spongy copper electrodes and by keeping the current density on the electrodes below 0.1 ma per sq. cm.

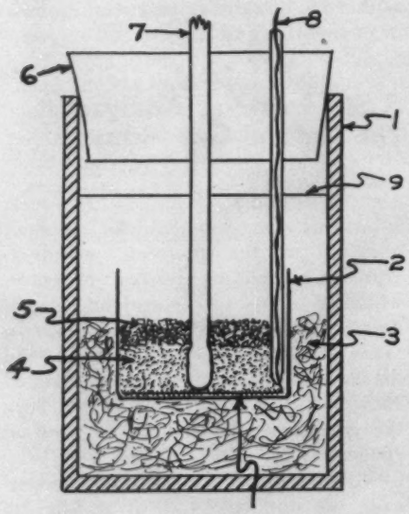
7. The resistance of the voltmeter circuit must be measured and a correction applied for IR drop unless the circuit resistance is negligible compared with the voltmeter resistance. The error caused by IR drops is negligible with a potentiometer.

8. Potentials measured with a saturated copper sulfate half-cell in soils will differ from those made with a saturated calomel half-cell by 70 $\pm$5.0 mv at 25°C, the calomel being anodic or negative.

9. A half-cell suitable for field use has been designed, on the basis of these conclusions.

Steps have been taken to patent this half-cell. When the patent is obtained it will be dedicated to the public.

Fig. 1 shows how this half-cell may be adapted for field use, the electrolyte contact in this case being made through a porous pot. Other arrangements may be better adapted for certain purposes provided the following requirements are satisfied: (1) The copper electrode which has been plated with spongy copper must cover the bottom of a glass or other inert, insulating vessel so that the potential of the electrode is controlled by its upper surface. (2) The entire electrode surface must be well covered with powdered copper sulfate crystals. (3) Electrolytic contact must be made with the solution *above* the disc.



1. Coors porous porcelain crucible painted with warm paraffin on sides.
2. Glass crystallizing dish.
3. Glass wool.
4. Powdered copper sulphate crystals.
5. Copper sulphate crystals.
6. Rubber stopper.
7. Thermometer.
8. Copper strip cut from edge of copper disc and sealed in glass tube at both ends with sealing wax.
9. Level of copper sulphate solution.
10. Copper disc plated with spongy copper.

FIG. 1. Cross section of copper sulphate half-cell suitable for field use.

• SCOTT EWING, research associate, American Gas Association, Washington, D. C., in a paper, "The Copper-Copper Sulfate Half Cell for Measuring Potentials in the Earth," presented before the American Gas Association Distribution Conference, Chicago, Ill., April 17-19, 1939. Mr. Ewing's treatise is published by permission of the Director of National Bureau of Standards of the U. S. Department of Commerce.—(Abstract by G A S).

McCarter Leaves Presidency of N. J. Public Service Corp.

Thomas N. McCarter, president of the Public Service Corp. of New Jersey since the founding of the company 36 years ago, has announced his resignation from that office. Mr. McCarter has served as director of the American Gas Association, and is the donor of the McCarter medals for life saving by the Schafer prone pressure method of resuscitation.

In resigning, Mr. McCarter recommended the creation of two new offices, that of chairman of the board of directors and chairman of the executive committee.

■ ■

Joice, Iowa, Votes Franchise

The Peoples Natural Gas Co., Omaha, Neb., was granted a franchise to serve natural gas by the citizens of Joice, Iowa, in an election held April 11. The company will begin construction immediately of a distribution system, which will be completed within 30 to 60 days. Approximately 40 customers will be served. The system will be under the supervision of C. P. Harrison, superintendent of the company's Forest City, Iowa, district.

■ ■

Advertising Manager Named

G. A. Saas has been appointed advertising manager of the Citizens Gas and Coke Utility of Indianapolis, Ind. Effective April 1, the utility set up its own advertising department to prepare and place copy.

Industrial Applications Of the Luminous Flame

• **JAMES E. DARE, Public Service Co. of Northern Illinois, Streator, Ill., in a paper, "Luminous Flame and Its Application," presented before the American Gas Association Industrial Gas Sales Conference, Hotel Statler, Cleveland, Ohio, March 27 and 28, 1939.—(Abstract by G A S).**

THERE have been many interesting developments in combustion equipment and application of gas in the past few years but none more interesting or of greater importance to the average industrial gas engineer than that pertaining to luminous flames.

JAMES E. DARE

For judging the degree of luminosity that may be expected, the following general rules apply:

1. The greater the amount of secondary air admitted at the burner in proportion to primary air, the greater will be the luminosity.

2. Excess air reduces luminosity, not so much at the beginning of combustion as towards the end.

3. Excess fuel increases luminosity, particularly towards the end of combustion.

4. Water vapor reduces the luminosity.

5. The better the mixing, the smaller is the luminosity.

6. The lower the velocity from the gas burner, the greater is the luminosity.

7. Increasing the preheat temperature of the air (regenerative preheat air) about 1700°F. reduces the luminosity if the velocity (from the gas burner) is high, but increases luminosity if the velocity is low.

8. Luminosity increases with the thickness of the flame.

9. Turbulence decreases luminosity.

The advantages offered through proper application of luminous flame combustion over non-luminous flame combustion may be listed as follows: (1) an increased rate of heat transfer; (2) more uniform and evenly distributed temperature control; (3) less maintenance of furnace refractories; (4) greater degree of turn down of burners; (5) formation of scale which requires much less trouble to remove as well as reduction in scale.

The increased rate of heat transfer is due to the radiating power of the incandescent carbon particles. The result might be better fuel economy, increased quality of product, or more tonnage per square foot of hearth area.

More uniform temperature distribution through proper application of luminous flame has been experienced due to the progressive uniform release of heat as the flame travels over the work. This results in increased quality of product, increased die or roll life, reduction in refractory maintenance, and fuel economy.

Reduction in refractory maintenance is quite evident due to more uniform temperature distribution and lower flame temperature.

Greater degree of turn down with a luminous flame burner insures flexible operation without shutting off one or more burners. Luminous flame burners have a turn down as high as 20 to 1, whereas non-luminous flame burners have a turn down of not higher than 6 to 1. This greater degree of turn down allows more accurate control of furnace atmospheres on low fire.

Formation of scale which results in much less trouble to remove as well as reduction in the amount of scale may be explained as follows: When products of combustion are subjected to high temperatures, they dissociate to form an atmosphere which is highly oxidizing, producing a considerable amount of hard tough scale which is very difficult to remove before rolling or forging. The non-luminous flame depends almost entirely on heat transfer through convection and conduction such that nascent oxygen does come in contact with the surface of the steel. With a luminous flame at materially lower temperatures, scale formation is considerably reduced. Practice has shown that the type of scale formed with a luminous flame is also very soft and easy to remove, thereby increasing die life and eliminating to a great extent scale being pressed, rolled or hammered into the steel.

Luminous flame combustion has been most successfully applied in the following industrial heating processes:

1. *Steel Industry:* (a) Heating stock for rolling mill work. (b) Heating stock for forging work. (c) Soaking pits. (d) Open hearth melting. (e) Heating for annealing, normalizing and hardening. (f) Miscellaneous high temperature steel processing.

2. *Glass Industry:* (a) Melting. (b) Refiner control temperatures. (Rotating pots.) (c) Lehrs. (d) Mould heating.

3. *Miscellaneous Applications:* (a) Side fired galvanizing tanks. (b) Large lead melting pots. (c) Frit furnaces. (d) Terra cotta and pottery kilns.

There are at least seven manufacturers that are now in a position to supply luminous flame burners of known capacity and rating and at standard prices.

Burners rated at a maximum of 250 cu. ft. per hour (natural gas 1000 B.t.u. per cu. ft.) to burners rated at a maximum of 12,000 cu. ft. per hour are available. Most of the burners have a maximum turn down of 20 to 1. The various sizes available or combination thereof certainly should be sufficient to meet any heating requirement one might encounter in industry.

In general, air and gas pressure from 3 to 14 in. of water column are required for the various burners in order to maintain normal rating and control as well as maximum burner efficiency.

Where gas is sold on an interruptible or off peak basis, it is very necessary to install burners that are readily convertible to a standby fuel such as oil. Several of the burner manufacturers sell burners that are readily convertible to oil. In general, the conversion from gas to oil only entails removing the inside parts of the gas burner and inserting in their place (leaving the main body of the burner in place) the oil burner parts. This

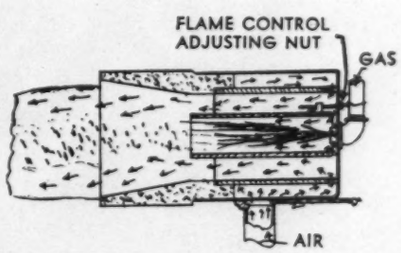


FIG. 1. Long soft flame.

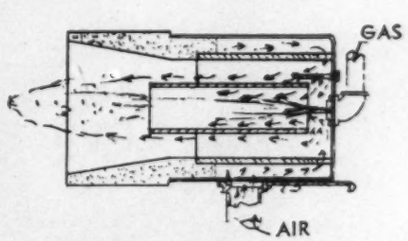


FIG. 2. Short sharp flame.

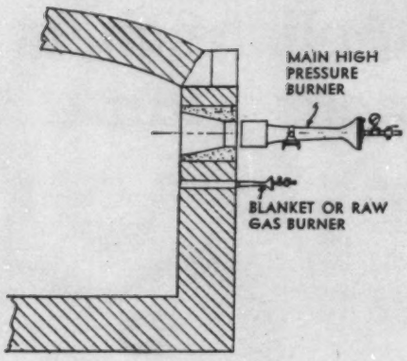


FIG. 3.

change can be accomplished in many cases in a few minutes.

In general the fundamental design is a method of controlling the amount of primary and secondary air admitted at the burner. This is accomplished in any one of the following ways, depending on the design of the burner.

1. Through the use of a series of concentric rings inside the main burner body as shown in Figs. 1 and 2. The type of flame or degree of luminosity is controlled through manipulation of the flame control adjusting nut. Fig. 1 shows the setting for a long, soft luminous flame whereas Fig. 2 shows the setting for a short, sharp flame.

2. Through the use of a rotary air valve provided with two ports, namely one supplying primary air and the other secondary air.

3. Through the use of a control gas, the function of which is to permit a control of the velocity of gas stream and its burning characteristics.

4. Through the use of concentric rings for admitting air progressively to the outside boundaries of the gas stream and cracking a small amount of the air gas mixture within the burner itself by means of a special ignition burner.

In general, the burners available are capable of producing satisfactory luminous combustion when utilizing gases varying from a mixture of coke-oven and blast-furnace gas of 350 B.t.u. per cu. ft. to natural gas of 1500 B.t.u. per cu. ft. Propane or butane can also be used satisfactorily as standby fuel. Luminosity increases as the number of glowing or incandescent carbon particles increases.

When utilizing a gas having a low carbon content and high hydrogen content oil can be added at the burner to increase the carbon content or luminosity. Several burner manufacturers are now in a position to sell standard burners which are designed to burn a small amount of oil with the gas in order to produce the desired type of luminous flame.

If high pressure gas is available (5 lbs. per sq. in. to 30 lbs. per sq. in.) and a customer wishes to take advantage of this fact to eliminate the use of a blower or fan for supplying air for combustion, a high pressure inspirating burner can be used in conjunction with a blanket or raw gas burner, as shown in Fig. 3. The burner application merely consists of a high pressure inspirator set highly oxidizing in order to supply the required amount of air at sufficiently high temperature to crack the raw gas (from the blanket burner) and completely burn the same before leaving the furnace. The blanket burner can be a plain pipe, having a small outlet at the end (1/16-in. or 1/8-in.) or a small inspirating burner having a large orifice. The writer has used this method of firing for conversion of furnaces varying in size from a rolling mill furnace (65 ft. long by 18 ft. wide by 7 ft. high) to small slot forges (4 ft. long by 2 ft. wide by 2 ft. high) with equal success. Accurate control of furnace atmosphere, flame position, combustion and temperature control can be obtained with this special design of firing as well as any desired degree of luminosity.

Controlling Pressures

(Continued from Page 40)

case a fixed bleed or vent is used to take care of the displacement of gas from the upper diaphragm chamber at such time when there is a slight increase in reduced pressure downstream, causing the diaphragm to move upward and the inner valve to close.

The temperature boosting and pressure loading auxiliary regulator comprises a conventional house service regulator, capable of reducing the upstream or intermediate pressure to a desired loading pressure in ounces on the top side of the main regulator diaphragm. A temperature mechanism is also connected to this loading regulator to produce a downward thrust on its diaphragm in conjunction with adjusting spring as regularly used with a loading regulator. The temperature element attaches to a length of flexible transmission tubing with a temperature bulb at its outer end and normally located outside the regulator station and exposed to atmospheric temperature. This temperature mechanism is so arranged that with a decrease in temperature an added thrust is placed against the loading regulator diaphragm causing an increase in its reduced pressure delivered to the main valve diaphragm. This creates an increase in reduced pressure on the outlet side of the main regulator. By means of adjustable fulcrums the amount of pressure boost in ounces can be increased or decreased per ten degrees drop in atmospheric temperature. Since the temperature-pressure loading must fit each individual condition of service, a secondary adjustment enables the operator to set the device to start temperature boosting at any desired temperature point of 70 degrees or less. A third adjustment allows the regulator to be set for a minimum reduced pressure for warm weather conditions when the temperature boosting mechanism is not affecting the delivered pressure from the auxiliary loading regulator.

The maximum boost-limit or top-limit regulator is used to prevent an excessive pressure at any time when an extremely cold atmospheric temperature may cause the temperature loader to deliver a greater pressure to the system than would be desired. The maximum boost-limit regulator may be adjusted to prevent the pressure on the discharge side of the main valve from going beyond a predetermined maximum as desired by the operator.

At night when the load demand on a system is at a minimum and the atmospheric temperature is of low value, there would be an excessive pressure delivered to the system were it not for the use of the clock-operated time control. This device is virtually a low pressure regulator with clock mechanism for placing this regulator in and out of service over any predetermined time period.

During this night period, this regulator can be set so that the main regulator will deliver a constant night minimum pressure of low value to the low pressure system.

The advantages to be derived by automatically controlling both the intermediate and low pressures in a distribution system are reduction in "unaccounted for" gas, time and car mileage saved over manually controlling the pressure, and reduction of the severe changes in pressure on the service lines which will reduce the number of appliance adjustments, reduce customer complaints, and render a better service to the consumer.

Building Commercial Load With the Small Boiler

• **W. E. LAND, industrial gas engineer, Public Service Co. of Northern Illinois, Chicago, Ill., in a paper, "The Small Gas-Fired Boiler as a Means of Building the Commercial Gas Load," presented before a company meeting on industrial and commercial sales activities held at the Southern Division Gas headquarters, Blue Island, Ill., January 17, 1939.—(Abstract by GAS.)**

SMALL gas-fired boilers, through the past decade, have been a good means of putting on new and desirable gas loads. The small steam boiler load is extremely desirable from the gas company standpoint. It is not seasonal in that most jobs are year-around operations. A certain percentage of the load is a night load, and summer loads help offset the winter house heating load.

A nice all year-around gas load which is often overlooked by the commercial gas man is that of the small, corner tailor shop. This business, though individual establishments, uses gas in only small quantities, does due to its numbers, run into a goodly volume each year. Due to the smallness of the appliances used, they have been somewhat neglected, and the equipment has become notoriously inefficient. The inefficiency of this equipment has created considerable dissatisfaction with the resultant high bill complaint.

Tests in the field indicate that the small tailor shop boiler averages an efficiency of 46 to 52 per cent. Naturally with some such equipment, the small tailor shop can expect nothing but a relatively high gas bill. Gas men should at every opportunity encourage this small but important user of gas to put in better gas equipment.

Better Equipment

In the opinion of those experienced in the field, better equipment is the salvation of securing and holding this class of business, rather than a reduction in the price of gas. Compare, for a moment, what it really means to the user of those small gas-fired boilers. The difference between an efficiency of, let us say, 50 per cent and 80 per cent. With 800 B.t.u. gas, a boiler working at 50 per cent efficiency consumes 83.2 cu. ft. per boiler hp. Whereas, at 80 per cent efficiency this same quantity of steam can be generated with 52.3 cu. ft. of gas. This represents a saving of more than 36 per cent.

This same story of efficiency applies to many other small industrial process steam users who buy gas all year-around. These include the small manufacturing tailor, the special worker of rubber goods, the tire vulcanizer, the small ice cream plant, the small laundry, the small dairy, industrial plating works, the small bake shop where steam is used for steaming ovens and other specific and miscellaneous users of small quantities of steam. The story of better equipment should be carried to these customers so that they will be satisfied users of gas, and in the long run there will be fewer high bill complaints and fewer jobs lost.

All of these smaller users of industrial gas fired boilers can avail themselves of the better makes of vertical gas fired boilers and they can also avail themselves of the more efficient horizontal boilers. There is also the fact that with the horizontal boiler there is the additional advantage of having all the tubes below the water line so that the usual corrosion occurring in the vertical boilers is eliminated. We must also consider the point that with the horizontal boiler, the mud and lime can settle below all immersion tubes, so that the usual hard scale and cake is not formed in the boiler. Thus, high operating efficiencies are maintained over a number of years.

Also, at least one manufacturer guarantees an 80 per cent thermal efficiency with this horizontal boiler and the same manufacturer guarantees the tubes against corrosion for a period of two years. This matter of tube corrosion has nothing to do with the high efficiency of the equipment. But, it does give the customer a degree of protection and a savings resulting in lower maintenance cost.

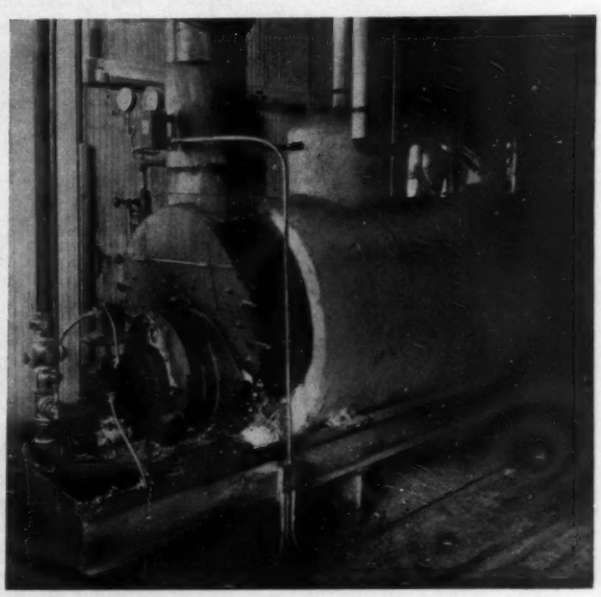
The larger consumers, those employing boilers of 8 hp. and larger, use sufficient quantities of gas to justify the use of the off-peak summer rate to a real advantage.

Those classes of businesses which can very easily avail themselves of this off-peak rate can be summed up as dairies, laundries, the larger commercial platers, ice cream plants, hotels, restaurants, hospitals, laundries, special processers of food using steam for numerous purposes and so forth.

Potential users of off-peak gas for water heating are the restaurants which are equipped with heating boilers. A very logical way of securing the water heating load is by means of a combination steam heated, as well as immersion gas-heated water storage tank. Or, another way of securing this load is to have a large storage tank with a steam coil. In the winter months steam can be taken from the heating boiler for heating the water. Then, in the summer months, a gas-fired boiler could be installed for supplying steam to this coil. This boiler can be placed on the off-peak rate, and, incidentally, makes a very desirable customer.

Summer Uses

There are many similar commercial applications where steam can be taken from the heating boiler in the winter months to supply the necessary heat for processing, and then the efficient gas fired boiler can be installed for supplying the same heat during the summer months. In most cases, companies are able to shift the firemen and engineers to other duties during the summer months, this saving alone, in many cases, being more than enough to pay for the operating expenses of the gas-fired boiler for the summer months.



Installation of a horizontal combination oil-gas boiler.

Southern Counties Gas Co.'s Butane-Air Standby Plant

A. F. BRIDGE

F. A. HOUGH

• **A. F. BRIDGE, vice president, and F. A. HOUGH, distribution engineer, Southern Counties Gas Co., Los Angeles, Calif., in a paper, "The Southern Counties Gas Company's Butane-Air Standby Plant," presented before the Spring Technical Conference, Pacific Coast Gas Association, Los Angeles, Calif., March 23 and 24, 1939, and at a meeting of the Southern California Meter Association, Huntington Park, Calif., March 30, 1939.—(Abstract by G A S).**

THE MATERIAL now in storage at the Southern Counties Gas Co.'s butane-air standby plant at Wilmington, Calif., has the following approximate composition:

	% by Volume of Vapor
Propane	50
Iso-butane	20
N-butane	30
Total	100

Heating value 2975 B.t.u. per cu. ft. at 60°F. and 30 in. Hg.

Specific gravity 1.83 (Air = 1.00)

Gas-air mixtures made at the plant with this material have ranged in heating value from 1357 B.t.u. per cu. ft. (specific gravity 1.38) to 1499 B.t.u. per cu. ft. (specific gravity 1.42).

The operation of a gas range and several radiant fire heaters set up at the plant for test purposes and burning the butane-air mixture without dilution with natural gas, indicated that the 1357 B.t.u. gas was a little too far over on the lean side. This was especially true when such a mixture was burned in a burner that had been adjusted to give a sharp, hard flame with natural gas.

These same appliances operated very satisfactorily on butane-air mixtures having heating values in the range from 1420 to 1499 B.t.u. per cu. ft. The range top burners did not produce yellow-tipped flames while burning gas of this heating value even though the burners were adjusted to give a very soft flame when burning natural gas.

The plant will produce a mixture of butane-air and natural gas of any specified composition and will deliver this mixture to the distribution system at any desired pressure up to 35 lbs. per sq. in. It will produce a 1460 B.t.u. mixture of butane and air, continuously, at the rate of 188,500 cu. ft. per hour, and can, for short periods, send out such a mixture at the rate of 237,500 cu. ft. per hour. These send-out rates are respectively equivalent, on a B.t.u. basis, to 249,000 and 315,000 cu. ft. per hour of 1100 B.t.u. gas.

Storage facilities have been provided for 375,000 gals. of butane, a quantity sufficient to operate the plant at its rated capacity (including plant fuel) for 5.64 days, producing the equivalent of 34,000,000 cu. ft. of 1100 B.t.u. natural gas.

In the gas manufacturing process, butane vapor flows from a heat exchanger through a motor valve into a stream of compressed air (see Fig. 1). The motor valve in the butane-vapor line is controlled by a Bristol ratio controller, connected across an orifice in the compressed-air line and across an orifice in the line carrying the mixture of butane and air, and adjusts the motor valve so that the ratio of the butane vapor to air remains constant. The flow of the butane-air mixture to the distribution system is controlled by an ordinary pressure regulator. Natural gas flows into the butane-air mixture downstream from this pressure regulator, through a motor valve which is controlled by a second ratio controller, producing a constant ratio of natural gas to butane-air flow. Fig. 2 shows the butane vaporization and butane-air mixing equipment. The small piping and regulators in the foreground handle liquid butane to the vaporizer—the apparatus with the flanged ends. The large regulator in the center of the picture controls the flow of butane vapor to the butane-air stream. Air enters the stream through the vertical column, which is an air cooler, at the corner of the building.

If it is desired to make a major change in the composition of the gas sent out, this is accomplished by changing one or two of the orifices in the

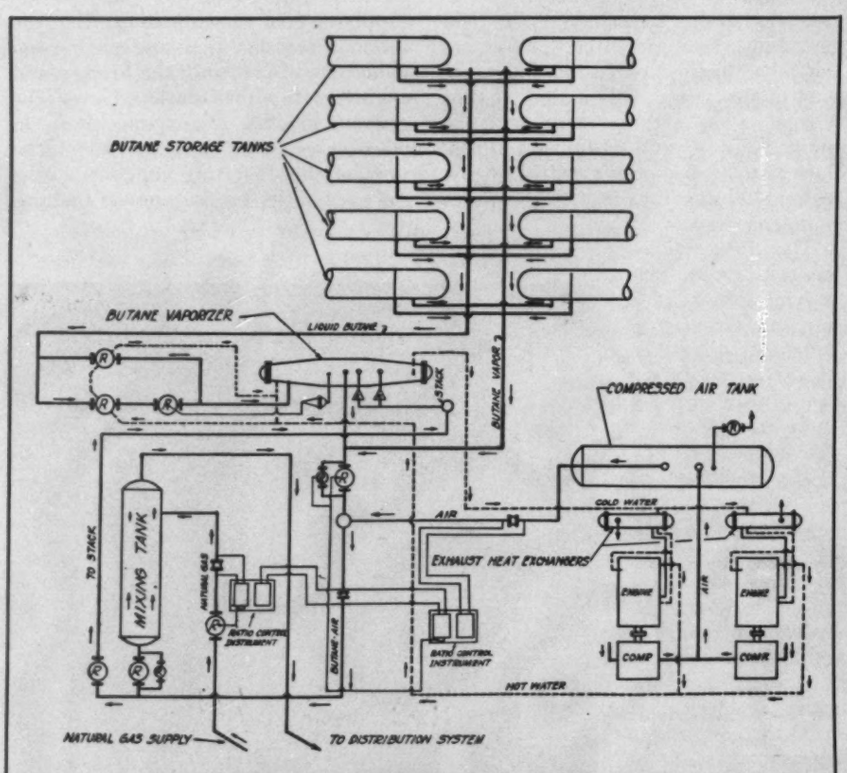


FIG. 1. Flow diagram of the Southern Counties Gas Company's butane-air standby plant at Wilmington, California.

air, butane-air and natural gas meters. Adjustments in the composition of the gas produced can also be made by means of small bypass valves across the differential connections to the ratio controllers.

A check on the composition of the butane-air produced is obtained by means of a recording gravitometer which records the specific gravity of the gas-air mixture entering the mixing tank.

This instrument is equipped with an electrical range-limiting device. If the specific gravity of the gas-air mixture gets beyond the safe limits for which the recording gravitometer is set, the instrument closes an electrical circuit which in turn shuts the valve through which the butane-air flows to the distribution system and opens the stack valve, discharging the plant output to the stack until the operator locates the difficulty and brings the specific gravity of the mixture back within bounds. When this occurs the recording gravitometer puts the plant back on the line again and closes the stack valve.

Short interruptions to the flow of gas into the distribution system due to occurrences of this sort are not serious because high-pressure holders are riding on the distribution system.

The plant has shown itself capable of putting out gas over a wide range of rates of flow; however, to insure accurate control of composition of output it is necessary to change the sizes of the orifices in the orifice meters when a large change in rate of output is to be made.

Controls for the plant are centralized at a control board. After the plant has been started and put on the line, its operation is entirely automatic. An operator can obtain from this board complete information concerning the functioning of the butane vaporizing and gas mixing equipment. He can shut down the plant or make minor changes in the composition of the gas mixture from the board. He can also change the pressure at which gas is delivered to the distribution system.

Three operators are required to run the plant. The chief operator handles the control board, another operates the engines and air compressors, and the third works outdoors, manipulating valves as directed by the chief operator and observing liquid levels in tanks and vaporizer.

The air compressor installation consists of two Fuller rotary free vane compressors designed to operate at a maximum speed of 650 r.p.m. At this speed they will discharge 1015 cu. ft. of free air per minute at 45 lbs. per sq. in. pressure, and require 156 hp. at the shaft.

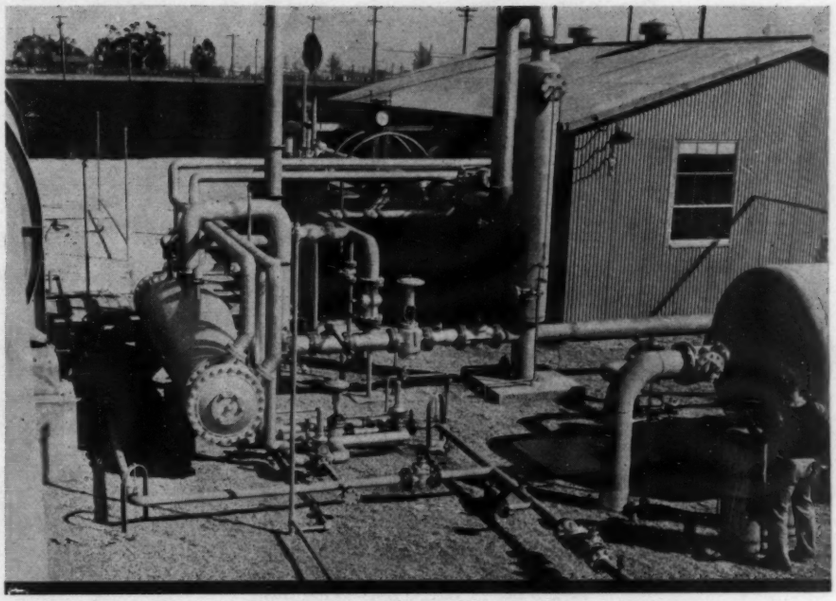


FIG. 2. Butane vaporizer and butane-air mixing equipment.

Each of these compressors is direct connected to a 175 hp. Hall-Scott marine engine.

The waste heat from these engines provides all of the heat required to vaporize the butane; and, conversely, most of the cooling required for the gas engine is accomplished by vaporizing butane.

Vaporization of the butane is accomplished in a steel-shell heat exchanger with hot water circulated through admiralty metal tubes and liquid butane on the outside. Water used for this purpose is circulated in a closed system and is heated by the exhaust gases from the gas engines and by passing through the engine jackets. The temperature of the water entering the heat exchanger is about 165°F. and that leaving the heat exchanger is about 100°F.

Liquid butane from storage passes through a pressure reducing valve set to hold 45 lbs. per sq. in. on the discharge, thence through a motor valve controlled by a float actuated liquid level controller, and finally into the heat exchanger. The liquid level controller is set to hold the butane liquid level in the heat exchanger so that approximately one-half of the tubes are submerged. The tubes above the liquid level serve to superheat the butane vapor a few degrees. This is done to prevent condensation of butane vapor in the vapor line between the heat exchanger and the butane vapor motor valve.

The storage equipment consists of 10 horizontal cylindrical tanks 10 ft. 6 in. by 68 ft. over-all, with hemispherical heads, each having a gross capacity of 41,840 gals. and a net capacity of 37,500 gals., and designed for a maximum working pressure of 125 lbs. per sq. in. The tanks were designed in accordance with the A.P.I.-A.S.M.E. Code for unfired pressure vessels. They were shop fabricated and of all-welded construction, and were stress-relieved after welding.

Each tank has a 20-in. diameter circular manway in the top near one end; four 4-in. ACF relief valves are installed in the covers of these manways. A 3-in. vapor connection and a 2-in. liquid connection are provided on each tank. Each tank is equipped with a rotating dip-type liquid level gage.

The vapor connections on all tanks connect to a 6-in. vapor header, and the liquid connections to a 3-in. liquid header. These headers run under the tanks which are shown in Fig. 3.

Considerable thought was given during the designing of this plant to the elimination of fire and explosion hazards. An endeavor was made to comply with the provisions of the Industrial Accident Commission's *Liquefied Petroleum Gas Safety Orders* in all respects, and design has gone considerably farther than those orders require in the provision of fire-control and explosion-prevention facilities. Investigation and analysis of the fire and explosion hazards connected with a butane standby plant lead to the belief that the following points are of paramount importance:

1. All piping connected to the stor-

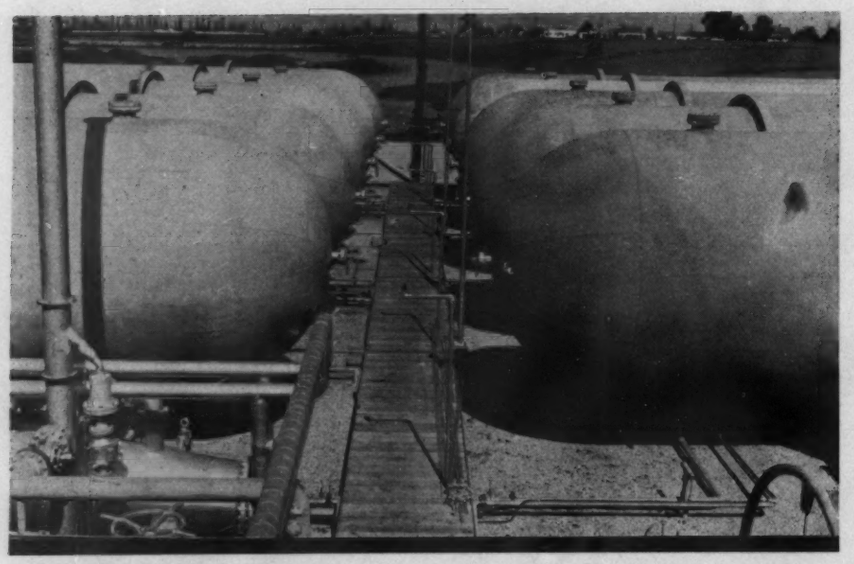


FIG. 3. Butane storage tanks, showing liquid level gages in the end of each tank and fog nozzles over the center of the walls.

age tanks must be designed to provide adequately for any temperature or earthquake stresses that might occur.

2. Provisions should be made for keeping the tank plates cool in case they are exposed to a fire.

3. Provision should be made to reduce the pressure in a storage tank below that for which the relief valves are set, in case the tank is exposed to a fire.

4. Precautions should be taken to prevent the accidental formation and ignition of explosive gas-air mixtures in large tanks, and other pieces of plant equipment that might not be able to withstand the pressure developed should an explosion occur.

Solving a Problem

The first of these points is important because the breakage of a line carrying liquid butane and connected to a storage tank is a fairly common type of failure and if this occurs large quantities of liquid butane are released. The solution of this problem involved among other things the use of extra heavy steel valves bolted directly to the flange connection on the tanks. All tank piping consists of seamless tubing with welded joints. All welders were required to pass a rigid test, and the quality of their workmanship was subjected to frequent inspection and test. Expansion bends and flexible hanger supports were provided to take care of temperature stresses, and the whole piping system was anchored to restrict the movement of the piping in case of an earthquake.

Excess-flow valves on the liquid lines were not provided because such valves would have to be set to permit withdrawal of liquid from storage at the high rate required for plant operation, and this rate of flow from a broken pipe would create a very hazardous condition. Instead an electrically operated closing device is installed on the tank valves, consisting of a weight connected through cables to lever arms on the tank valves. The weight is supported by a solenoid. As long as there is current flowing through the solenoid, the weight remains suspended and the valves can be operated manually without interfering in any way with the automatic device; however, if the operator wishes to close the valve quickly from the control board or from emergency stations located at different points in the plant enclosure, he simply opens the switch which de-energizes the solenoid circuit, permitting the weights to drop and close the valves.

A circuit consisting of an insulated copper wire in a lead sheath—the sheath serving as one conductor—runs along all butane piping in the plant and also extends to various locations that are hazardous from the fire standpoint. Low voltage is applied to this circuit, which holds a relay closed in the tank valve solenoid circuit. If a fire starts in the vicinity of this low-voltage circuit, the lead sheath will melt, shorting the circuit, thus closing any tank valves in the plant that happen to be open; or if an explosion occurs in the plant which breaks any butane piping, the circuit will be broken and the tank valves closed.

Several accidents have occurred involving butane storage facilities, which illustrate the need for keeping tank plates cool. On several occasions casinghead gasoline or liquefied petroleum gas tanks have exploded when exposed to a fire in spite of the fact that their relief valves were adequate and functioning. Rupture occurred because the tank plates got so hot that they were no longer strong enough to stand the internal pressure for which the tank relief valves were set. Such failure can occur only in that portion of the tank above the liquid level.

Water Fog Spray

To provide against this contingency a water fog spray system has been installed which will completely surround all of the tanks with a dense fog. Water in this finely divided state presents such an enormous surface for the absorption of heat that a very effective chilling of flames and cooling of tank metal can be accomplished. The water supply and piping are adequate to discharge 1800 gals. per minute through the fog nozzles. The fog-water system is divided into five sections, any one of which can be controlled from a station located outside the plant enclosure.

Means have also been provided for lowering the pressure in the storage tanks below that for which the relief valves are set. This can be accomplished by discharging and burning butane vapor at the top of a stack 100 ft. high. Fig. 4 shows the method used for igniting the vapor at the top of the stack. A mechanically operated valve-

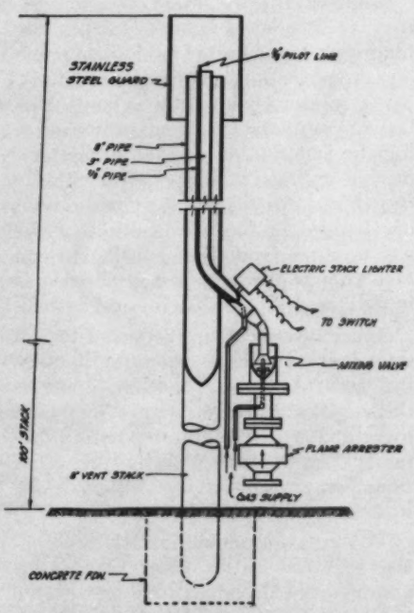


FIG. 4. Cross section of vapor discharge stack showing ignition system.

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For thirty years...since 1909...good gas and WARD FLOOR FURNACES have proved to be *a winning combination!* This fine, vented furnace . . . with its *automatic* Bilt-in Thermo-Control, its *automatic* Safety Pilot, its Cradle Circulator . . . wins consumer good will because it proves efficiently that *gas is the clean, safe, economical fuel for heating.*

That builds load. It protects load, too, because WARDS are permanent equipment. They become a permanent part of the house and "set you in solid" for years to come.

May we send your our new catalog and price list?

YOUR LOAD IS AS GOOD AS THE APPLIANCE YOU SELL

CONFORMS WITH NATIONAL SAFETY REQUIREMENTS · AMERICAN GAS ASSOCIATION · APPROVED

THE WARD

AND A WARD

This dealer's floor display model of the WARD FLOOR FURNACE, swivel-mounted, with center section of floor register removed and the inner and outer shells cut away to reveal the heating element, has helped sell plenty of furnaces for gas utilities. But most of all, WARDS have been sold by consumer satisfaction, by consumers telling each other how pleased they are with WARD performance. Why not put this potent "selling force" to work on your lines?

WHY SHOULD A GAS MAN HIRE AN ELECTRICIAN?

Brotherly love is a nice thing, but to us it has always seemed odd for a gas man to call an electrician to help install a gas floor furnace. That's what you have to do when you sell a furnace with electric controls. BUT... when you install a WARD FLOOR FURNACE there are *no wires to run, no electric connections.* The controls are built into the furnace. They work *automatically.* The entire furnace is self-contained... easy to install. Just drop it into the floor opening (it hangs from the joists), connect to vent and gas line, and it is ready for service. An experienced gas fitter installs a WARD FLOOR FURNACE in a day.

GUARANTEED 10 YEARS... BUILT FOR LIFE!

WRITE TODAY FOR OUR NEW CATALOG AND PRICE LIST

WARD HEATER COMPANY, LOS ANGELES

FACTORY REPRESENTATIVES

A. S. KINCAID	J. H. STUBBINS	H. C. SANDERSON	W. D. ROBERTS	LEON M. TAYLOR
2012 North Harwood	300 East 68th Terrace	207 Fulton Building	468 Peoples Gas Building	3200 Main Street
Dallas, Texas	Kansas City, Missouri	Pittsburgh, Pennsylvania	Chicago, Illinois	Dallas, Texas

FLOOR FURNACE

opening device has been provided which permits the opening of all vapor valves on the storage tanks from a remote point. Use will be made of this vapor discharge system only as a last resort.

To take care of the accidental formation of butane-air mixtures in the plant equipment several precautions have been taken. All inter-connections between the air and gas system are equipped with two lubricated plug valves with a blow-off between. Normally these two valves are kept shut and the blow-off open, so that there can be no leakage from one system into the other. All of the gas-mixing controls have been so arranged that whenever the plant is shut down the various automatic valves assume a safe position such that leakage of gas into the air system, or vice-versa, is impossible. The only known source of ignition for gas-air mixtures within the plant piping and apparatus is the flame which burns at the top of the stack when gas is being discharged into the atmosphere; therefore a flame arrestor has been installed between the stack and the rest of the plant piping.

Other precautions have been taken in the design of the plant which tend to reduce to a minimum the danger of fire and explosion. For example, all open flames have been eliminated. Flame arrestors have been placed on the air intakes to the engines. The engines and all of the electrical equipment other than yard lights and tank valve solenoids have been isolated in a building in which there is no equipment carrying high pressure gas.

All controls and valves in the plant have been so arranged that by simply throwing an electric switch the compressor plant is shut down, all tank valves are closed, all control valves take the correct position for shut-down, and the stack valve opens, reducing the gas pressure in the mixing equipment to atmospheric pressure. These emergency shut-down switches are located on the control board and at all gates in the fence surrounding the plant property so that if anything happens an operator can run to a gate immediately and shut down the plant as he goes out.

■ ■

Southern Calif. Gas Co. Makes Personnel Changes

The Southern California Gas Co., Los Angeles, Calif., has announced three changes in executive personnel: M. A. Seeley has been transferred from the Huntington Park district to Glendale, where he is district agent; Oliver Jacobi, formerly at the Glendale office, is now district agent at Bakersfield; and R. F. Ogburn has moved from Bakersfield to Pasadena as assistant district agent.

Our Economic Budget--Does It Balance? Show a Surplus?

● **A. M. BEEBEE, Rochester Gas and Electric Corp., Rochester, N. Y., in a paper, "Is the Economic Budget of the Gas Industry Balanced, Or Has It a Surplus?" presented before the Annual Business Conference of the New England Gas Association held in Boston, February 16 and 17, and before the convention of the Commercial and Technical Divisions of the Gas Section of Wisconsin Utilities Association, Milwaukee, March 13 and 14.—(Abstract by GA S.)**

WE have heard a great deal on the desirability of a balanced budget. In reality, a balanced budget means merely "sound economics." In other words, it means that the disadvantages are counterbalanced by advantages. But a mere balanced budget gets nowhere. Under such conditions matters stand still, and history during such periods tells us we are apt to begin to fall behind.

If our budget shows a deficit, then certainly we are hastening the backward spiral. However, if our budget shows a surplus, then indeed we have an opportunity to progress.

Let us analyze the budget of the gas industry. Let us see what the fundamental economics of our industry are. Is the economic budget of the gas industry balanced, or does it show a deficit or a surplus? In other words, are our advantages greater, the same, or less than our disadvantages?

Let us first consider what the Gas Industry's economic liabilities are.

Liabilities

1. Our biggest bond issue is due to the fact we have pretty generally monopolized the cooking fuel requirements of our country. This is at present perhaps our largest and most important responsibility. Can we meet the issue when due, and can we even carry a greater liability in this regard?

2. We have a second bond issue in providing the water heating needs of the communities in which we operate.

3. We have a preferred stock issue in the refrigeration needs of customers.

4. We have a preferred issue in the house heating fields.

5. We have considerable common stock in the industrial heat markets of our country.

6. We should carry a reserve to overcome the popular impression, which has been associated with our industry, that we are going backwards.

7. We need a depreciation fund to meet the threatened loss of markets to other fuels.

As to whether we have a surplus or a deficit depends on whether or not our assets exceed these liabilities, and we cannot determine this until after we have evaluated our assets. Therefore, let us next consider our assets.

Assets

1. Plant Property. Our main plant item consists of a number of complicated forces of value. Let us analyze these factors on which our industry rests, as follows:

(a) Gas and electricity are merely convenient forms of transmitting energy. Where light and power are concerned gas has no particular advantage. However, where heat is desired, it can generally do three times as efficient a job as can electricity, in delivering the energy in a fuel into useful energy available to a consumer. This is due to the conversion efficiencies inherent in the processes.

(b) A corollary to the above is that less investment is likewise required for gas to perform this service, so that in general such transportation of energy can take place at a cost to the customer of about one-half that needed for electricity.

A particular point in this connection is worthy of again repeating, which is taken from those most interesting studies of Mr. Russell and Mr. Ginna on the relative costs of serving the domestic customer needs with gas and with electricity. These studies show that a combination gas and electric service for lighting, cooking, waterheating and refrigeration is to the best interest of the customers, as well as the company, and requires a total investment only 2/3 that of the all-electric idea. These studies show that the all-electric cooking and waterheating service to the customer, is only profitable to the company at a cost to the customer twice the cost of equivalent gas service. At equal costs to the customer, it is ruinous to the company.

Another interesting set of data in the previously mentioned paper, "Econom-

JOHN ZINK BURNERS

While you are in Tulsa

We Invite You — Not to miss seeing one of the most unusual manufacturing plants in the country.

HERE YOU MAY SEE—

The John Zink Floor Furnace
In Two Sizes

Conversion Furnace Burners
For Domestic Furnaces

Commercial & Industrial Burners
For Heating and Power Boilers

JOHN ZINK BURNERS—Tulsa, New York

Tulsa Plant — 4401 South Peoria Ave.

New York—342 Madison Ave.

ics of Energy Distribution," shows that these domestic services are now being supplied to a customer at existing gas and electric rates by the combination gas and electric service at a cost lower than a similar all-electric service, even at the proposed New York State Power Authority rates. It is clear, therefore, that a combination gas and electric service is doing already a better job than the Government hydro programs hope to be able to do with subsidized rates. How, then, is anyone being helped by these Government hydro programs, particularly when one considers the detrimental effect that they have on the mines and railroads? This point will be discussed later.

(c) Heat requirements of a community are far in excess of the requirements for light and power and therefore, the fields available to gas are indeed great. When we consider the energy used in the typical average home today in this country, the ratio is from 8 to 1 in the form of gas as compared with electricity. Furthermore, when it is realized the large amounts of coal and oil used in a typical community, it is at once apparent what a small portion of the heat needs of that community are now supplied with gas.

2. Materials and Supplies. The source of energy for our industry be it coal, oil, or natural gas comes from nature's storehouse of which this country is blessed with an almost unlimited supply. Therefore the main materials and supplies of our industry are, for practical purposes, unlimited.

3. Notes Receivable. While we have pretty well saturated the cooking markets of our country with gas, our water heating market is only about 10 to 20 percent saturated, and our refrigerating and house heating markets even less so. Our "accounts receivable," therefore, are indeed great and in general are awaiting our service, as soon as the purchasing power and improved standards of living of our country will allow it.

4. Investments. Since our major source of energy is coal, we have considerable interest in the mines, railroads and heavy industries that supply them, all of whom are large employers of labor. We are therefore contributing to the building of the purchasing power of the country, relieving the unemployment, and helping to spread the wealth, which should enable eventually a higher standard of living and a resultant broader market for our products.

5. Working Capital and Cash in Bank. This item consists of our existing loads, particularly the domestic cooking load, which has frequently been a subject of much speculation.

It can be shown that gas for cooking is more efficient in energy used than electricity, and more economical to the customer, and also is capable of excelling the biggest feature of electric cooking, namely, the development of the clean, cool, odorless kitchen.

General Observations

The above would seem to indicate that our budget was more than balanced and that we should have considerable of a surplus to use to improve our position. As you study this matter carefully, I think you will become convinced that few industries have so many favorable factors to work with. Now let us look at the record to consider the practical effect of some of these fundamentals to indicate whether we really have a surplus, as indicated by progress.

The growth of the gas load to over five times that of 30 years ago, at which time gas was an already established and seasoned industry, is a matter of record. This is remarkable since during that period we have seen the electric industry rise to great importance. In the past few years of the depression, there has been a slight halt in this rapid growth, yet when we look at the figures, it is remarkable how stable it has been. We have all seen the continuous and striking advances which natural gas has made and there are those who have felt that the record of manufactured gas was not very impressive.

However, many of the figures that we have seen have been based on figures that were not strictly comparable for a number of reasons, such as: properties changed to natural gas, changes in thermal values, etc. But when we take truly comparable figures, it is interesting to see the result, bearing in mind that the following figures are for manufactured gas operations in the entire country:

	House Heating Sales M Cu. Ft. Pct. Increase	*House Heating Revenue Pct. Increase*
1934	42.6	33.5
1935	24.1	20.0
1936	22.0	16.8
1937	11.0	9.2
1938	10.0	12.0

	Commercial and Industrial Sales M Cu. Ft. Pct. Increase	*Pct. Increase Revenue*
1934	18.0	5.0
1935	12.6	3.8
1936	20.7	11.7
1937	11.1	4.5
1938	1.0	.2

	Domestic Sales M Cu. Ft. Pct. Increase	*Revenue Pct. Increase*
1934	—1.0	—1.4
1935	—2.0	—2.3
1936	—1.6	—2.0
1937	—1.1	— .5
1938	+1.5	+1.6

The combined figures for the entire operation listed above show as follows:

	Total Manufactured Gas Sales Pct. Increase	*Revenue Pct. Increase*
1934	+5.8	+1.0
1935	+3.6	—0.1
1936	+6.6	+1.7
1937	+4.0	+1.2
1938	+2.5	+2.2

Certainly these figures indicate a good healthy growth.

When it comes to consideration as to the future of our industry, again we can see many conditions that are sound. As our standard of living rises, people will certainly want cleanliness and freedom from dirt and nuisance. We can convert efficiently low grade fuel, such as oils or coal, into a clean gas to provide the heat requirements of the country which is a far greater amount of energy than that needed for light, power and the other energy needs in a community.

In these troubled times with wars being fought on all sides of us, the gas plant plays a most important part in a program for national defense. The residuals produced are of such value in times of war that the continuation of this type of industry is definitely in the public interest.

Therefore, in closing, I think you will agree with me that the economic budget of our industry not only is balanced but causes a substantial surplus that can move in but one direction, namely, forward. Let's not just ride with it, but let us put our shoulder to the wheel and help it along.

■ ■

Philadelphia Co. Promotes C. H. Frazier and J. V. Postles

The promotion of Charles H. Frazier, Jr., and John V. Postles was announced recently by The Philadelphia (Pa.) Gas Works Co.

Mr. Frazier was appointed manager of the Internal Audit department. He was formerly with The United Gas Improvement Co., Philadelphia, in the Executive Division.

Mr. Postles was appointed engineer of works. He has been with the Philadelphia Gas Works for 26 years, and during 1937-38 served as chairman of the Technical Section of the A. G. A.

■ ■

Utility Plant Head Dies

George G. Summers, 73, superintendent of the gas plant of the Metropolitan Utilities District, Omaha, Neb., died March 27 following five weeks illness.

THE *Economy* OF LOWERED NIGHT TEMPERATURE AT AN *Economy price*

THE *Symbol* OF THE NEW AUTOMATIC HEATING

THERE'S real economy in lowered night temperature and more economy in Minneapolis-Honeywell gas regulator packages — now available at prices heretofore believed impossible, yet M-H quality throughout.

The Y78 Time-O-Stat Package (illustrated above) provides lowered night temperature and a true economy gas control set. It consists of a silent solenoid gas valve, transformer, T801A Time-O-Stat and all necessary fittings. This set permits night temperature to be controlled at any point between 45° and 55° F. with automatic return to day temperature at any time selected within eleven hours.

The Y121 Package (illustrated below) uses the famous Series 10 Circuit and includes the universally accepted Heat accelerated Acratherm, the silent solenoid gas valve and all fittings. It permits manual opening and automatic recycling of gas valves. This set does not provide lowered night temperature.

The Y26 package (not illustrated) does offer this added feature. It differs from the Y121 package by including the Da-Nite Acratherm in place of the Acratherm. Minneapolis-Honeywell Regulator Company, 2946 Fourth Avenue South, Minneapolis, Minnesota.

MINNEAPOLIS-HONEYWELL

Brown Industrial Instruments *Control Systems*

Use of Directional Relays For Electrical Drainage

● **REPORT OF THE Subcommittee on Pipe Protection, Transmission Committee, "Directional Relays for Electrical Drainage of Pipe Lines." by C. R. DAVIS, The Montana Power Co., Butte, Mont., and R. W. WAINWRIGHT, Montana-Dakota Utilities Co., Minneapolis, Minn., presented for discussion at the Spring Technical Conference of the Pacific Coast Gas Association, Los Angeles, March 23 and 24.—(Abstract by GAS.)**

IN order to eliminate the detrimental effect of stray currents and yet retain the benefits of negative pipe potentials, it has been common practice among engineers for a number of years to install drainage cables from the mains to street railway substation negatives, thus providing a metallic connection for the current to leave the pipe.

However, in some instances it has been found that the stray current problem cannot be solved by so simple a means, because a multiplicity of substations and of interconnecting rail systems may cause current to flow on the pipes in various and changing directions depending upon the locations and movements of the electrically-powered cars. In order to prevent this reverse flow it was found necessary to install directional relays at the various drainage points of the Montana Power Co.'s Butte distribution system, which would permit current flow only toward the negative feeders.

The type of relay developed by the authors for the particular application to drainage systems, arises from new advances in the uses of electron tubes. The circuit as shown in Fig. 1 is based on a G. E. F-17 Thyratron which, operating through an oven-type relay, controls a 200 amp. contactor in series with the drainage cable. "A" is an ordinary radio filament transformer having a 2.5 volt center-tapped winding for the tube filament supply, and a second 2.5 volt winding which furnishes power for a small rectifier in the grid circuit. Although low voltage alternating current may be used for the negative grid bias, direct current as supplied by the rectifier proved to give more stable operation. The 5000 ohm potentiometer in series with the grid provides a means of controlling the rectified grid bias and the 50,000 ohm resistor limits the grid current to a safe value.

As may be seen in the diagram (Fig. 1), the grid circuit is completed through the gas main, ground, rails, and cable to the filament center-tap. When the contactor stands open and the rails have a positive potential with respect to the main, the grid becomes negative beyond the critical value already existing, and the tube blocks the isolating transformer "B" from causing current to flow in the plate circuit. Hence, the contactor remains open.

With the potential reversed across the contactor, the grid becomes less negative than the existing bias, allowing the plate circuit to pass sufficient current on the positive half-cycle to operate the oven-type relay "C" which in turn operates to close the contactor "D." Immediately upon closing, the contactor short-circuits the external pipe-to-rail grid circuit, whereupon the pipe-to-rail grid voltage falls to a low value depending on the voltage drop across the section of cable a-b due to current flow. Since this drop is sufficient to hold the grid voltage above the critical value the contactor remains closed. However, should the current reverse through the cable while the contactor is closed, the small voltage drop in the cable section a-b also reverses and serves to bring the grid voltage below the critical value, thus opening the contactor to the original position.

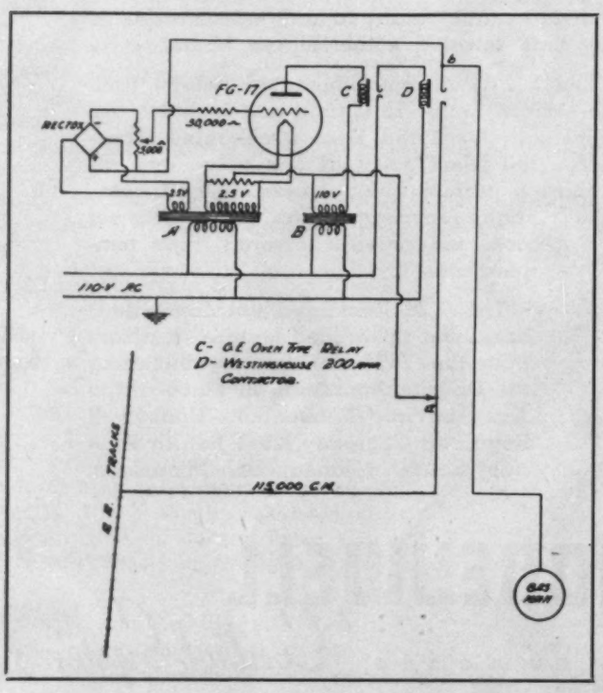


FIG. 1. Directional thyratron tube relay five-mile protective unit, Montana Power Co., Butte, Mont.

◆

Actually the apparatus will not cut off the reverse current at the exact zero point. To prevent the plate circuit from "fluttering," the grid must be biased somewhat less negative than the critical value. Otherwise, the contactor when short-circuiting the external grid circuit would produce a positive voltage drop insufficient to prevent the grid from dropping to its critical value and opening the relay. This margin, of course, permits a small reverse current to flow before the mechanism is actuated.

Another problem which is encountered in the thyratron set-up is that of ambient temperature control. Since the operating characteristics, including the critical grid voltage, of mercury vapor tubes change with the tube temperature, this type of relay must not be subjected to a too violent temperature change, and the fact that the actual temperature of the tube varies as it blocks or allows current flow, gives an added reason for allowing a slight margin on the grid bias. The locality where the first relay was installed is subject to very great and rapid temperature changes. The temperature often varies as much as 50° in 24 hours. This difficulty has been overcome by installing a thermostatically controlled heater which controls the temperature inside of the relay housing within 2°. The relay operates very satisfactorily at 70° F.

◆

Community Natural Gas Co. Shifts District Managers

J. Y. Wheeler, Texas-Oklahoma division superintendent of the Community Natural Gas Co., Dallas, has announced the transfer of three district managers. Clyde W. Clack, formerly manager at Durant, Okla., has been transferred to McKinney, Texas; A. G. Debbens, manager at Guthrie, Okla., succeeds Mr. Clark at Durant; F. V. Williams, formerly of McKinney, has been made district manager at Corsicana, Texas.

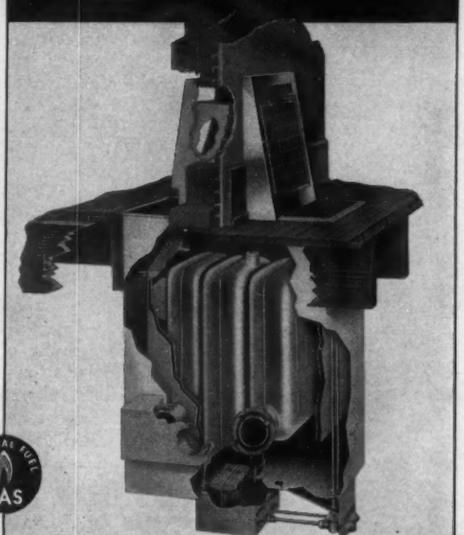
Get your share of this huge market

***350,000**
FAMILY UNITS BUILT IN 1938!
(The majority without basements)
*AN ESTIMATED INCREASE OF
25% to 35% in 1939

*Dept. of Commerce, U. S. Govt.

WITH THE

PAYNE DUPLEX FLOOR FURNACE



The Payne Duplex Floor Furnace is the logical 1939 volume seller . . . the logical 1939 load builder . . . *because it was especially designed for just this kind of a market.*

Use Payne Duplex Furnaces as a powerful bid for this huge market againt other kinds of fuels. Give these smaller, non-basement homes the worry-free economy of gas . . . the low initial cost and simple, pipeless installation of Payne Duplex Furnaces . . . *the luxury of Payne quality.* And cut down unprofitable service calls.

A single Duplex Furnace is well able to heat two and three-room suites. It is hung from floor joists directly below partitions, eliminating the expense of basement excavation and long leader pipes.

The Payne Duplex Furnace furnishes an abundance of the same kind of heat as the basement-type warm air furnace. Cold air is drawn through cold air registers in the floors, is re-heated and returned to the rooms, providing constant warm air circulation at uniform room temperature.

The Payne Duplex Furnace may be controlled manually, by push-button or thermostat. Registers are furnished in handsome antique brass, becoming to any room.

Comfort . . . health . . . convenience . . . and economy! Payne Duplex Furnaces meet every one of the requirements of your big 1939 market.

Write today for the Payne Duplex Furnace folder containing full information and specifications.

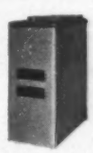
THERE IS A PAYNE GAS FURNACE FOR EVERY HEATING NEED

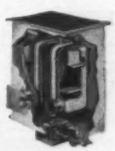
PAYNE MODEL "A" FURNACE
May be installed singly or in batteries of two or more, each operating independently and warming separate rooms or suites. Here is *zoned* warmth, where you want it, when you want it, at controlled temperature.

PAYNE MODERN CONSOLE
Outstanding beauty! Efficient circulating warmth! They're both combined in this handsome heater. Choice of five harmonizing colors in six different sizes. Heavy insulation.

PAYNE FORCED AIR UNIT
Offers warm, filtered forced air circulation in winter, c-o-o-l-i-n-g ventilation in summer. Requiring no basement, the "FAU" may be installed in kitchen, closet or on the service porch. Automatic control.

PAYNE ZONEAIR UNIT
The last word in "Spring-conditioning"—heats, filters, ventilates, humidifies and circulates. May be set up in batteries for zoned conditioning. Its streamlined beauty enhances any basement playroom.





PAYNE FLOOR FURNACE
Especially designed for homes without basement, but extreme simplicity of installation, economy — abundant fresh *circulating* warmth — has made it a universal favorite. Fully vented.

Payne Furnace & Supply Co., Inc.
BEVERLY HILLS • CALIFORNIA

SALES Slants

A Good Salesman Knows A Picture Equals 1000 Words

IT IS an axiom in advertising and publicity that one picture is worth a thousand words. Smart salesmen find the same thing applies to their own profession.

Seeing is believing. Tell a person a thing is so; and though you do it with all the persuasiveness and sincerity at your command, he believes you or not according to the amount of skepticism in his makeup.

But show him it is so—prove by actual and irrefutable demonstration that your claims are probable—and there is no way he can avoid accepting your statements, no matter how vigorous his predisposition to doubt.

"This porcelain enamel," you point out to a prospect, "has a really amazing capacity to withstand hard service. It will not scratch or crack under blows, and all ordinary smears, stains and the like rub right off."

If you are a good salesman, your voice and manner will carry a strong message of conviction. But how much more telling the point would be if you put it over visually. Suppose, for instance, you scuffed the clean, smooth surface you were demonstrating with your shoe; and then erased the mark with a cloth. Could the prospect fail to be impressed? Or suppose you produced a number of bright colored balls and began bouncing them off the enamel at a distance of 10 or 15 feet, proving that such blows cause no damage whatever. Wouldn't that be dramatic proof of your point?

Many successful sales careers are built on just such clever dramatizations of sales points. Analyze your own sales presentation and see wherein you can spot similar concrete illustrations to clinch your points. Gas appliance selling particularly lends itself to this approach. A little study will disclose any number of features of gas ranges, water heaters, space heaters and refrigerators that may be brought out in a dramatic manner.

If a live appliance is handy, as an example, the speed, accuracy, flexibility and cleanliness of gas can be emphasized in many telling ways:

Place a Pyrex dish over the flame and prove by wiping the bottom of the dish with a clean handkerchief that it is absolutely sootless. Using a Pyrex dish again, show the prospect how the flame spreads evenly over the cooking surface, producing an even distribution of heat. Bring water to a boil in a Pyrex dish and prove the evenness of heat distribution by pointing out how the whole surface of the water breaks into a boil at once. Turn the flame up and down rapidly, showing how it responds to the adjustment of the valve in much the same way an automobile responds to the accelerator.

These and a large number of others, depending upon the equipment available, are concrete demonstrations that have proved effective. The salesman with imagination will do well to develop his own.

■ ■

Out of Self-Confidence Grows Enthusiasm and Earnestness

NO ONE who lacks confidence* in himself can win the confidence of other people. Before you can fill a good job, you must first *believe* that you can fill it. The boxer who goes into bout uncertain of his own prowess is more than half whipped before the first blow is struck.

So you must be self-confident. But self-confidence does not mean boastfulness nor cock-sureness, nor over-positiveness. Being positive of a thing is all too often only being wrong at the top of your voice. The braggart deceives nobody—usually not even himself. He's often only making a loud noise to keep up his own courage, to cover up his own weaknesses. Real self-confidence is not a matter of words.

Genuine self-confidence is based on knowledge—knowledge of one's self and one's work. When you have conquered a difficulty for the first time you are always thereafter its master. It's a good plan at the end of every day to take five minutes and reckon on your victories. As for your defeats, take plenty of time and study them carefully to find out why you lost—and don't make the same mistake twice.

Out of self-confidence grows enthusiasm and earnestness. For the man in earnest, nothing is impossible. Enthusiasm keeps men young and strong. It is the steam in the boiler, the "juice" on the trolley wire. Earnestness in a man will make him many friends, enthusiasm will help him over a thousand obstacles.

* Reprinted from "The Blue Flame," Philgas Department, Phillips Petroleum Co., Detroit, Mich.

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"Rigging Up" Contest Results Predict Success of Campaign

Returns for the "Rigging Up" contest sponsored by Servel, Inc. as a part of the A.G.A. Refrigeration Committee's "Man-the-Sales" spring sales campaign, show that the 231 high salesmen entitled to cash awards have sold an average of over two refrigerators more than were sold by the March winners in last year's contest. R. J. Rutherford, chairman of the Refrigeration Committee, states that there are more gas utilities enrolled in this year's campaign than in last year's, and that the offering of models of the famous clipper ship, "The Flying Cloud," to winning companies as the emblem of successful selling has met with enthusiastic approval by men and management of the larger number of utilities engaged in pushing gas refrigerator sales in an effort to win a ship.

In Boston at the annual meeting of the sales division of the New England Gas Association, March 31, enthusiastic endorsement was given the campaign in view of the fact that the original "Flying Cloud" ship was built and launched in Boston in 1851.

■ ■

Committee Heads of Midwest Sales Council Announced

William M. Riach, Jr., chairman of the Midwest Industrial Gas Sales Council of the Industrial Gas Section, A.G.A., has announced the appointment of the following committee chairmen:

George L. Ballard, Panhandle Illinois Pipeline Co., Competitive Fuels Committee; Nelson R. Gorsuch, Citizens Gas & Coke Utility, Luminous Flame Committee; H. F. Rehfeldt, Peoples Gas Light & Coke Co., Program Committee; Paul F. Gibson, Western United Gas & Electric Co., Publicity Committee.

■ ■

Dallas Gas Appoints Griffing

Clifford V. Griffing has been appointed to succeed C. A. Caldwell, who died January 20, as credit manager for the Dallas (Texas) Gas Co.

P&G CONTEST TO PUSH GAS REFRIGERATION AMONG MILLIONS OF LISTENERS AND READERS!

. . . SERVEL ELECTROLUX STARS IN GREAT RADIO AND MAGAZINE TIE-IN CAMPAIGN

IN THE SIX WEEKS from May 22 to July 2, 360 Servel Electrolux are to be offered as prizes in six big weekly Contests sponsored by Procter & Gamble. On the air over 93 stations and in national magazines, an audience of millions will be told about the outstanding advantages of gas refrigeration in the daily announcements to be made for the P & G Soap contests.

You're going to win more prospects and make more sales in 1939 as a result of the tremendous advertising support being given to this great tie-in program. Get your company 100% behind this profitable tie-in program . . . and *push!* It's an additional and unusual opportunity for you to win sales and good will for gas and gas service in 1939!

The **SERVEL** **ELECTROLUX** *Gas Refrigerator*

THE REFRIGERATOR YOUR CUSTOMERS HEAR ABOUT—BUT NEVER HEAR

A.G.A.E.M. Rewards Winners Of Advertising Contest

WINNERS in the nationwide contest conducted by the Association of Gas Appliance and Equipment Manufacturers awarding prizes to advertising managers of gas utilities and combination companies, whose local advertising activities best tied-in with the American Gas Association's 1938 national advertising campaign, were announced March 10 by F. E. Sellman, chairman of the contest committee, as follows:

First Prize: $200—W. R. Squier, advertising manager of the Washington (D. C.) Gas Light Co.; Second Prize: $100—R. T. Ratliffe, advertising manager of the Kansas City (Mo.) Gas Co.; Third Prize: $100—Jay C. Barnes, advertising manager of New Orleans (La.) Public Service, Inc.; Fourth Prize: $100—Gerald A. Higgins, advertising manager of the Boston (Mass.) Consolidated Gas Co.; Fifth Prize: $50—J. Lyman Gollegly, advertising manager of the Central New York Power Corp., Syracuse, N. Y.; Sixth Prize: $50—Robert Kanze, advertising manager of the Illinois-Iowa Power Co., East St. Louis, Ill.; Seventh Prize: $50—Henry Lawson, advertising manager of the Springfield (Mass.) Gas Light Co., and Eighth Prize: $50—Dale Remington, advertising manager of the Wisconsin Public Service Corp., Green Bay, Wis.

The board of judges was composed of Henry Obermeyer, assistant vice-president of the Consolidated Edison Co. of New York; Earl Pearson, general manager of the Advertising Federation of America, and Raymond C. Mayer, public relations counsel. Charles Byrd of the A.G.A.E.M. acted as secretary to the contest committee.

The companies whose advertising managers were cited as winners will be presented with certificates attesting the awards.

The competition, officially opened on March 1, 1938, was planned to stimulate greater interest on the part of local companies in the A.G.A.'s national advertising campaign. It was aimed at inducing gas companies to tie-in their local promotional efforts more closely to the national advertising effort.

All forms of local advertising such as newspaper copy, window displays, direct-mail and other promotional literature, radio, magazine space, and car-cards and outdoor billboard advertising, were eligible for entry in the competition.

It was required that all campaigns submitted tie-in with the national campaign, either by the use of material offered by the American Gas Association, or by the use of text matter, slogans or art work similar to that which appears in the national advertising.

It was required, also, that each entrant's local program center around the promotion of one or more gas appliances of a specific manufacturer. In this connection, however, the advertising heads were allowed to enter as many local campaigns as they wished.

◆

The judges and contest committee chairman in the advertising competition conducted by the A.G.A.E.M. among advertising managers of gas utilities and combination companies inspect the entry of the national winner, W. R. Squier, advertising manager of the Washington (D. C.) Gas Light Co. Left to right are (seated): F. E. Sellman, chairman of the contest committee; Henry Obermeyer, Consolidated Edison Co. of N. Y.; Earl Pearson, Advertising Federation of America; and (standing) Raymond C. Mayer of New York, public relations counsel.

◆

Gas Dominates 1939 Midwest Hotel Show in Chicago

MORE than 26,000 delegates attended the 1939 Midwest Hotel Show at the Stevens Hotel, Chicago, March 7-10, conducted under the sponsorship of the Illinois Hotel Association and the Greater Chicago Hotel Association with the cooperation of the Chicago Restaurant Association and nine surrounding state hotel associations. Of the 125 exhibitors staging a display of hotel goods and services, 15 showed modern commercial gas burning equipment, making 12 per cent of the entire show a gas show.

In addition to booths by such manufacturers as Detroit-Michigan Stove Co., Standard Gas Equipment, and American Stove Co., the Peoples Gas Light and Coke Co., Chicago, exhibited special gas appliances in a separate booth.

During the Fuel Symposium, T. J. Gallagher, manager, commercial sales department, Peoples Gas Light and Coke Co., pointed out the advantage of gas for the positive control of heat in volume cooking.

■ ■

A. E. Higgins Heads Sales Of Pittsburgh Equitable Co.

A. E. HIGGINS

In a recent announcement, Col. W. F. Rockwell, president of the Pittsburgh Equitable Meter Co., Pittsburgh, stated that Capt. A. E. Higgins, a vice-president of the firm, has been placed in charge of sales for both the Pittsburgh Equitable Meter Co. and its subsidiary, the Merco Nordstrom Valve Co.

Before he became associated with the Pittsburgh Equitable Meter Co., Capt. Higgins was secretary of the Natural Gas Section of the American Gas Association.

■ ■

Omaha Utility Advertises Gas Ranges in Broadside

An institutional broadside entitled "Let's Be Gay in 1939" was mailed recently to 30,000 addresses by the Metropolitan Utilities District of Omaha, Neb., to stimulate spring gas range sales. The title was explained on the inside pages by the caption, "Bring Fun Into Your Kitchen With a Modern Automatic Gas Range!" and drawings and photographs showing the automatic, time-saving devices on the new gas ranges.

The broadside was prepared by Bozell & Jacobs, Inc., in Omaha.

■ ■

Roper Corp. Installs Display

The Geo. D. Roper Corp., Rockford, Ill., will open a display of Roper gas ranges June 1 on the fourth floor of the Western Furniture Exchange and Merchandise Mart, San Francisco. Mr. Roy Johnson, the company's representative in northern California, will be in charge of the display. Models of the various Roper ranges are stocked in the company's warehouse in Oakland.

In serving the tastes Of Thousands of FAIR Visitors..

WEDGEWOOD DELIGHTS BOTH MEN AND WOMEN ALIKE

At the Exclusive

YERBA BUENA CLUB

on Treasure Island

CATERING to the discriminating appetites of 850 men and women every day of the Fair, Wedgewood is a real treasure on Treasure Island.

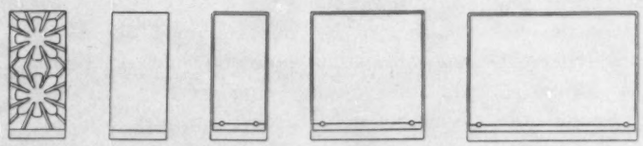
WEDGEWOOD HANDLES LARGE-SCALE FOOD PREPARATION

With the Greatest Possible SPEED, EFFICIENCY and ECONOMY

Custom-built to the needs of each chef and kitchen, Wedgewood Heavy Duty Ranges can prepare 20 per cent more food than any other range using the same floor space.

Burners are wider spaced and the cook-top is one-fifth larger. Any one of 26 different combinations of hot tops, griddles and open burners may be had. Yes! A Wedgewood is an inspiration to any chef.

THESE 5 DIFFERENT SECTIONS IN ANY DESIRED COMBINATION



OPEN TOP BURNERS | HOT TOP IN SECTIONS | SINGLE GRIDDLE | DOUBLE GRIDDLE | TRIPLE GRIDDLE

UNIFORM HEAT DISTRIBUTION

★

HIGH-SPEED HEATING

★

ECONOMICAL OPERATION

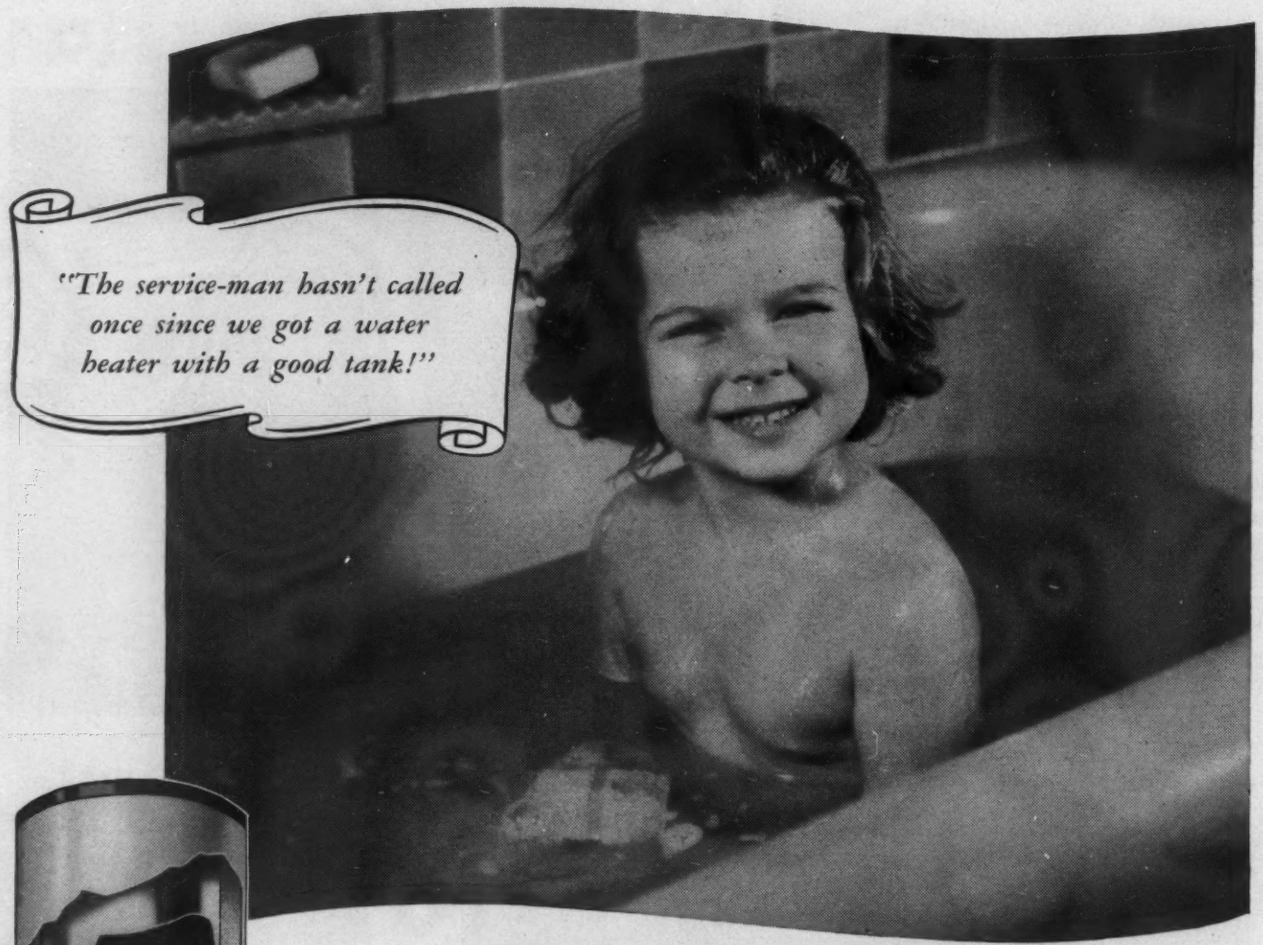
★

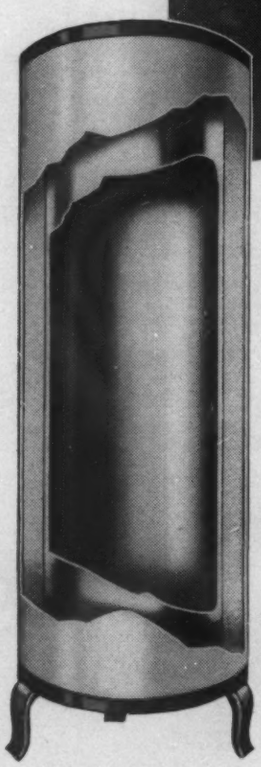
FLEXIBLE CAPACITY

Designed to use natural, manufactured or bottled gas.

WEDGEWOOD *Custom Built* HEAVY DUTY GAS RANGES

JAMES GRAHAM MANUFACTURING CO., SAN FRANCISCO, LOS ANGELES, NEWARK, CALIFORNIA; PORTLAND, OREGON





Enjoy a gas load that's not a service burden

Promote automatic heaters with lasting tanks of non-rust Everdur!

For the utility, water heaters with storage tanks of Everdur Copper-Silicon Alloy are profit-makers — because of the longer, better service they render. They provide a steady consumption of gas — uninterrupted by rust troubles. They mean fewer service calls . . . make possible more attractive term payment plans. For Everdur is absolutely rustproof, highly resistant to corrosion and has the tensile strength of steel.

Important, too, is the popularity of Everdur Metal. In bungalows and mansions, in clubs and hotels, laundries and schools, in fact wherever there's a demand for a rust-free supply of hot water, Everdur is the most widely used metal for non-rust tanks and heaters.

Promote Everdur equipped automatic water heaters in your campaigns. Every installation means better service, long-run economy and a happier customer. 3948

ANACONDA
from mine to consumer

Everdur TANK METAL

Visit the Copper & Brass Industry Exhibit in the Metals Building, New York World's Fair — 1939.

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT
In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont. • *Subsidiary of Anaconda Copper Mining Company*

"EVERDUR" is a trade-mark of The American Brass Company, registered in the United States Patent Office.

Hotel, Restaurant Gas Load Builders Meet May 22-23

OUT to "Make It *Boom Times* for Commercial Gas Sales," the Industrial Gas Section of the American Gas Association announces its 1939 Conference on Hotel, Restaurant and Commercial Gas Sales. The Hotel St. George, Brooklyn, N. Y., has been selected as the place; Monday and Tuesday, May 22 and 23 are the dates. Frank B. Herty, supervisor, retail sales, Brooklyn Union Gas Co., is vice-chairman of the Program and Arrangements Committee.

Featured luncheon speaker will be Clifford E. Paige, president, The Brooklyn Union Gas Co.; while R. J. Rutherford, vice-president, Worcester (Mass.) Gas Light Co. and president, New England Gas Association will close the Conference on the theme "The Where and How of Future Commercial Gas Sales." Other prominent gas industry executives are slated for rounding out management's participation in the program. Outside viewpoints and advice are anticipated from Peter G. Pirrie, editor, *Bakers Weekly*, and W. D. Tiedeman, chief, Bureau of Milk Sanitation, state of New York.

Manufacturers of commercial gas appliances will have their say through Arnold E. Schwarz, sales promotion and advertising, The Bryant Heater Co.; W. D. Crouch, manager, Commercial and Industrial Division, Robertshaw Thermostat Co., and R. S. Agee, sales promotion manager, Association of Gas Appliance and Equipment Manufacturers.

The army on the commercial sales firingline for utility companies will be represented through H. A. Sutton, Public Service Electric & Gas Co., Newark, N. J., and Roy P. Wilson, The Philadelphia Gas Works Co. "Making the Most of Salesmen's Time" will be Mr. Sutton's contribution; while Mr. Wilson, who chairmans the Industrial Gas Section's 1939 Commercial Refrigeration Committee, will get down to cases on "Penetrating the Commercial Refrigeration Market."

■ ■

Canadian Gas Association Meets in Hamilton, June 6-7

The 32nd annual convention of the Canadian Gas Association is to be held at the Royal Connaught Hotel, Hamilton, Ontario, June 6 and 7. The delegates to the convention will have an opportunity of seeing the reception given the King and Queen of England, who are scheduled to visit Hamilton the second day of the convention.

Zenn Kaufman, noted speaker, will address the convention on the subject of "Showmanship in the Canadian Gas Industry," it has been announced by J. D. Von Maur, chairman of the convention papers committee.

■ ■

Iowa Utility Asks Franchise

The Iowa Public Service Co., Waterloo, Iowa, will ask for a continuation of its franchise in the city of Waverly, Iowa, in an election to be held May 16. If granted, the company expects to erect a propane-air gas plant to replace the present carburetted water gas plant with medium pressure distribution system, according to a statement by A. C. Rathkey, division gas engineer. The storage tanks now in use would be utilized, but the rest of the plant would be completely new.

At the speaker's table during the luncheon, Conference on Industrial Gas Sales, sponsored March 27 and 28 by the A.G.A. Industrial Gas Section.

Industrial Sales Conference Features Discussion Groups

HEADLINE act of the Conference on Industrial Gas Sales staged March 27 and 28 by the Industrial Gas Section of the American Gas Association at the Hotel Statler, Cleveland, Ohio, was the final feature—something new on sales conference programs—an afternoon of "rotating panel" discussions, according to the concensus of opinion of the 175 delegates attending the meetings.

These discussions differ from the customary variety in that all are held in the same room at the same time, though on different subjects, enabling the delegate to circulate from one group to another as the topic demands his interest. Leaders of the informal groups were Committee Chairmen Clayton S. Cronkright (ferrous metals); Ralph D. Hawkins (non-ferrous metals); T. W. Halloran (food industries); George M. Parker (ceramic industries); and Charles R. Bellamy (industrial and commercial air conditioning).

Twelve speakers appeared before the two sessions. O. N. Sellers, Sellers Engineering Co., Chicago, in discussing immersion tube equipment, stated that customers could be saved 25 to 30 per cent in gas. Recent installations of the Dowtherm boiler were described by D. A. Campbell, Eclipse Fuel Engineering Co., Rockford, Ill.

C. F. deMey, A.G.A. Rate Committee chairman, outlined the reasons behind the variations in industrial rates. Wendell E. Whipp, president, National Machine Tool Builders Association, was the luncheon speaker.

Recirculating heating was the subject of Edward Stephenson, Jr., Surface Combustion Corp., while L. O. Howell, A.G.A. Testing Laboratories, reviewed research on reducing furnace atmospheres. Controlled atmospheres also was the topic of Dr. Bruce W. Gonser, Battelle Memorial Institute. James E. Dare, Public Service Co. of Northern Illinois, discussed the luminous flame (see page 45).

Franklin T. Rainey, Ohio Fuel Gas Co., outlined a plan for putting every employe on the industrial sales force. "Gas for *All* Heating Jobs" was the sales slogan proposed by I. Lundgaard, Rochester Gas & Electric Corp., while W. H. Eisenman, American Society for Metals, admonished that the best sales aid is a satisfied customer.

The meetings were closed with the showing of the all-technicolor film, "Steel," through the courtesy of U. S. Steel Corp.

■ ■

E. H. Fisher Named Coast Industrial Gas Co. Manager

Elmer H. Fisher, superintendent of the Coast Industrial Gas Co., with headquarters at Pittsburg, Calif., has been appointed manager of that company to succeed K. B. Anderson, who has just been appointed as superintendent of the gas department of the Coast Counties Gas and Electric Co.

B. A. Flynn of the Coast Industrial Gas Co. has been appointed superintendent of that company to replace Mr. Fisher at Pittsburg.

■ ■

Stove Co. Buys Walker & Pratt

The Kalamazoo Stove Co., Kalamazoo, Mich., has recently purchased the Walker and Pratt Manufacturing Co., Watertown, Mass. The Massachusetts company will be operated in the future as the Walker and Pratt Division of the Kalamazoo Stove Co., under the direction of L. Moore.

THE WOMAN'S *Viewpoint*

Our Book of the Month

We could almost claim as our own *Women at Work—A Tour Among Careers,* published in April by the New York Career Tours Committee of the American Woman's Association, 353 West 57th Street, New York City. For it tells the impressive story of women's achievements in the public utility industry and reviews the outstanding contributions made by such individuals as our own Mary E. Dillon, president, The Brooklyn Borough Gas Co. (Miss Dillon's picture and a sketch of her gas career appeared on this page in our February, 1939, issue); Mrs. Sara Sparks, who organized the Personal Service bureaus run exclusively by women for Western Union in 14 cities; and that good friend of this page, Mrs. Kenneth B. Norton, director of the Consolidated Edison Co. of New York, the world's largest utility operating company.

Margaret Culkin Banning, Inez Haynes Irwin, Dorothy Canfield Fisher, Ida M. Tarbell and Mary R. Beard are the five women writers contributing the main chapters of the book in which women's struggle and mounting success to win a place for themselves in business, industry, science, arts and medicine are dramatically reviewed.

In the book, there is important information about the more than 135 "career tours" which the committee has arranged for out-of-town women visiting New York for the World's Fair. The actual itineraries, "behind the scenes" in business and professions, are described for architects, nurses, musicians, librarians, doctors, home economists, insurance women, editors, writers, lawyers, and all other groups in which career women fall.

The book is exceptionally well illustrated with photographs, showing the part women are now playing in the business world.

Decidedly a "must" book for the career girl.

If We Tell, We'll Sell

Nobody could have got a greater kick than I did out of the guest editorial in our April issue by C. W. Berghorn, managing director, A.G.A. E.M. I am not a home service worker and as far as the "consumer movement" is concerned, I am strictly a receiver, and just like any other gal who takes her pocketbook to market. While I am not particularly aware of a concerted movement to educate me as a consumer, I do know that you have to keep your eyes skinned these days if you want to get full value for your hard-earned dollars. The old days of personal shopping with a confidence based on a long acquaintance with the storekeeper himself, are pretty well gone, and today we rely on "brands," labels and advertising for our appraisals of value.

So when I am told to look for the CP emblem on a gas range, it means something, for I am like most women, I suppose. Most gas ranges look alike to me—I couldn't look at two gas burners and tell you which is the more efficient—any more than I could tell you which is the better of two equally good-looking gas ranges. Now I know that the CP emblem is my protection against a bad buy. A label with a similar guarantee of quality on a can of fruit or a jar of face cream would be just as acceptable.

The gas industry has something with its exclusive CP emblem. But, just as our editor is so fond of saying, "The best idea in the world isn't worth a damn until it's put into practice," I say that the best label in the world is equally meaningless, unless we women thoroughly appreciate its significance.

If every woman in the gas industry would make a special point this week of telling only 10 of her housekeeping friends all about CP, it would be the finest kind of material contribution to the further building and bettering of the good old gas industry that gives us a living.

Our Woman of the Month

Several readers have written asking for a "profile" of Gertrude McKay Milne, vice president and general manager, Gainsville Gas Co., Gainsville, Texas. We are very happy to oblige, for in Mrs. Milne the gas industry has an operating executive of whom it is justly proud. In her turn, Mrs. Milne emphatically states: "In the gas industry, as in any other industry, a woman must not be afraid to accept responsibility, if she would succeed."

GERTRUDE McKAY MILNE

But here's the long overdue "profile."

After six years with the United States Radiator Co., Dunkirk, N. Y., my big opportunity came during the war, when the Gainsville Gas & Electric Co. found itself badly understaffed. In fact, my husband and I ran the office alone for 10 months. After that, it was my job to train the various clerks as they came, a responsibility which I have maintained to the present.

After being secretary to the manager and office supervisor and during the almost five-year period we were in receivership, the general accounting fell to my lot; I found this interesting and fascinating work. The court appointed me to complete my husband's term as receiver after his death in July, 1934. Even now, the telegram from my attorney: "Your bond accepted, you are now receiver," thrills me today just as much if not more than when I was advised that I had been appointed to my present position with the newly organized Gainsville Gas Co.

It has been said: "There can be little to the gas business if a woman can run it." Be that as it may, as far as I am concerned, it has taken eternal vigilance, courage and a real determination never to take advantage of my sex, and a willingness to sink my identity into that of the organization.

Having lived in a "gas" family for 20 years, three in the Milne family having been gas men, it was only to be expected that I would pick up some of the fundamentals, but more important still is the fact, I feel, that I have always found the gas industry full of interest and wholly absorbing.

Thank you, Gertrude McKay Milne, and many of us will underscore your observation about "never having taken advantage of your sex" in your climb upwards to executive ranking.

The JUBILEE PACEMAKER

Never Before So Good a Range at So Low a Price!

Detroit Jewel 69909-2J and Garland 39909-2J: Regular equipment includes: Modern wall-protecting backguard • Folding cover top • Flush cooking top • Aluminum-Nickel top burners • Automatic top lighter • Porcelain top grates and burner pan • Ball bearing drawers • 20-inch deep porcelain oven • Oven heat control • Insulated oven • Sanitary oven tray • Pull-out drawer broiler • Porcelain broiler pan and smokeless grill • Two utility drawers • Lamp • Manual time reminder • Condiment Set.

Detroit Jewel 69909 and Garland 39909: Same as 69909-2J and 39909-2J except with black base instead of white base.

Detroit Jewel 6990 and Garland 3990: Same as 69909 and 39909 except without lamp, time reminder, and condiment set.

Here's Everything You Need to Set a New Pace for Range Sales!

Instant Eye Appeal—The Detroit Jewel and Garland Ranges for 1939 have been declared by everyone who has seen them to be the most beautiful ranges any manufacturer ever produced! The Jubilee Pacemaker is no exception.

Sales Closing Features—The Jubilee Pacemaker gives you the kind of features that make your prospects want to buy your range. Not gadgets—but fundamental advancements which add to the convenience, quality, and economy of cooking.

High Quality Construction—The Pacemaker lives up in every respect to the standards of quality which have built an enviable reputation for these two famous names. The Pacemaker is a range you can be proud to sell—and that any customer can be proud to own!

Mass Price Appeal—The Jubilee Pacemaker is priced to include every prospect. We believe it is the most-for-the-money we have ever offered. It will make your store known for outstanding gas range values.

Send Now for Complete Descriptions and Prices Covering This New History-Making Range!

See the Detroit Jewel and Garland Exhibit at the New York World's Fair. Space 6, Gas Industries Building.

DETROIT-MICHIGAN STOVE COMPANY • DETROIT

DETROIT JEWEL AND GARLAND

Program Set for New York Convention of A. G. A. E. M.

A TENTATIVE program for the annual convention of the Association of Gas Appliance and Equipment Manufacturers to be held at the Roosevelt Hotel, in New York, May 24-25-26, has been announced by Lucian Kahn, chairman of the Association's convention program committee.

E. R. GUYER

E. R. Guyer, of Chicago, president of the Association, will welcome the delegates at the first general session at 10 A.M. on Wednesday, May 24th. At this session, R. S. Agee, sales promotion manager for the Association's domestic gas range division, will discuss sales promotion and its application to the gas appliance industry.

Beginning at 11 A.M. on Wednesday, the various product divisions will hold individual meetings under the leadership of their respective chairmen.

The principal speaker at the Thursday morning session will be the Honorable H. Styles Bridges, U. S. Senator from New Hampshire. He will address the manufacturer members on current legislative trends and how they are affected by national and international events.

Friday's (May 26th) general session will be held in the Gas Industries Building at the New York World's Fair. There in the "Court of Flame" Hugh H. Cuthrell, president of Gas Exhibits, Inc., will welcome the convention delegates and outline the predominant part that the gas industry is playing in this great international exposition. At this final session, Saul Cohn, president of the National Retail Dry Goods Association, will speak.

The closing event of this year's convention will be a luncheon to be given for delegates and their wives in the "Court of Flame" Restaurant in the Gas Industries Building at the Fair.

The general program has been so planned as to eliminate any afternoon sessions thus giving visiting delegates an opportunity to visit the World's Fair and to view New York's numerous scenic points of interest.

Oklahoma Utilities Hold 21st Annual Convention

ABOUT 400 executives and employes of gas and electric companies of Oklahoma attended the Twenty-First Annual Convention of the Oklahoma Utilities Association, at Tulsa, Okla., April 3 and 4.

Activities of the association were reviewed by Glenn C. Kiley, Oklahoma City, president of the organization, who presided over most of the sessions.

References were made to the $20,000,000 Grand River hydro-electric power project, now under construction in Oklahoma, by several speakers, including R. K. Lane, president, Public Service Co., of Oklahoma, and N. R. Graham, president, State Chamber of Commerce, both of Tulsa, Okla. Graham said he did not fear that hydro-electric development will disturb the private power industry in Oklahoma. He said that the state is now oversupplied with cheap power, including the "cheapest natural gas in the union."

Use of too many technical terms by the public utility industry in its dealings with the public was blamed for many misunderstandings with customers, by Edwin Vennard, vice-president, Middle West Service Co., Chicago, in an address entitled, "Let's Speak English."

Other addresses at the convention included: "Today, Not Yesterday Nor Tomorrow," by George A. Davis, vice-president, Oklahoma Gas & Electric Co., Oklahoma City; "Newspaper and Radio Viewpoint," Glenn Condon, manager, Station KOME, Tulsa Okla.; "Utility Advertising," by H. Vinton Potter, Oklahoma Natural Gas Co., Tulsa, and "World's Fair Exhibits," by W. L. Woodward, president, Zenith Gas Co., Alva, Okla.

The banquet and dance, Monday night, was attended by 450 utility people and their guests. Frank B. Long, vice-president, Oklahoma Natural Gas Co., Tulsa, was toastmaster, and Tom Collins, Kansas City Journal, Kansas City, Mo., was the principal speaker.

On Monday afternoon the ladies were taken for a visit to the Will Rogers Memorial, at Claremore. Upon their return they were entertained at a tea at the home of Mrs. J. P. Arnold, Tulsa.

At the board of directors meeting, R. K. Lane, Tulsa, president, Public Service Company of Oklahoma, was elected to the board to replace Fred W. Insull, deceased.

■ ■

Community Home Economist Helps Reduce Service Calls

Follow-up calls on new range buyers by Pearl Hughey, home economist in the Abilene, Texas, division of the Community Natural Gas Co., have materially reduced the number of service calls in that district, according to M. L. Bird, division superintendent.

Miss Hughey has found that many women blame their new ranges for cooking failures when the fault lies in the women's lack of experience with that type range.

■ ■

N.Y. Herald-Tribune Compiles New 1000-Page Cook Book

Over 3000 tested recipes, adapted to modern methods of cookery, have been compiled into America's *Cook Book* by the Home Institute of the New York Herald-Tribune (Scribner's, $2.50). The book, in addition to recipes, contains complete information on cooking essentials, menu-planning, social usage, food buying, dietary charts, and a glossary of American and foreign cookery terms. It has been compiled for use by the beginner as well as the experienced cook.

■ ■

Servel Saleswoman Leads Men With 215 Sales

Mrs. Gordon Surguine, saleswoman, United Electric Service, Inc., Monroe, La., has sold 215 Servel Electrolux refrigerators since she joined the company in April, 1937. Since June, 1937, she has led the local salesmen continuously in the sale of refrigerators.

The number of sales made by Mrs. Surguine entitle her to membership in the Servel 200 Club and Quintuplet Club.

■ ■

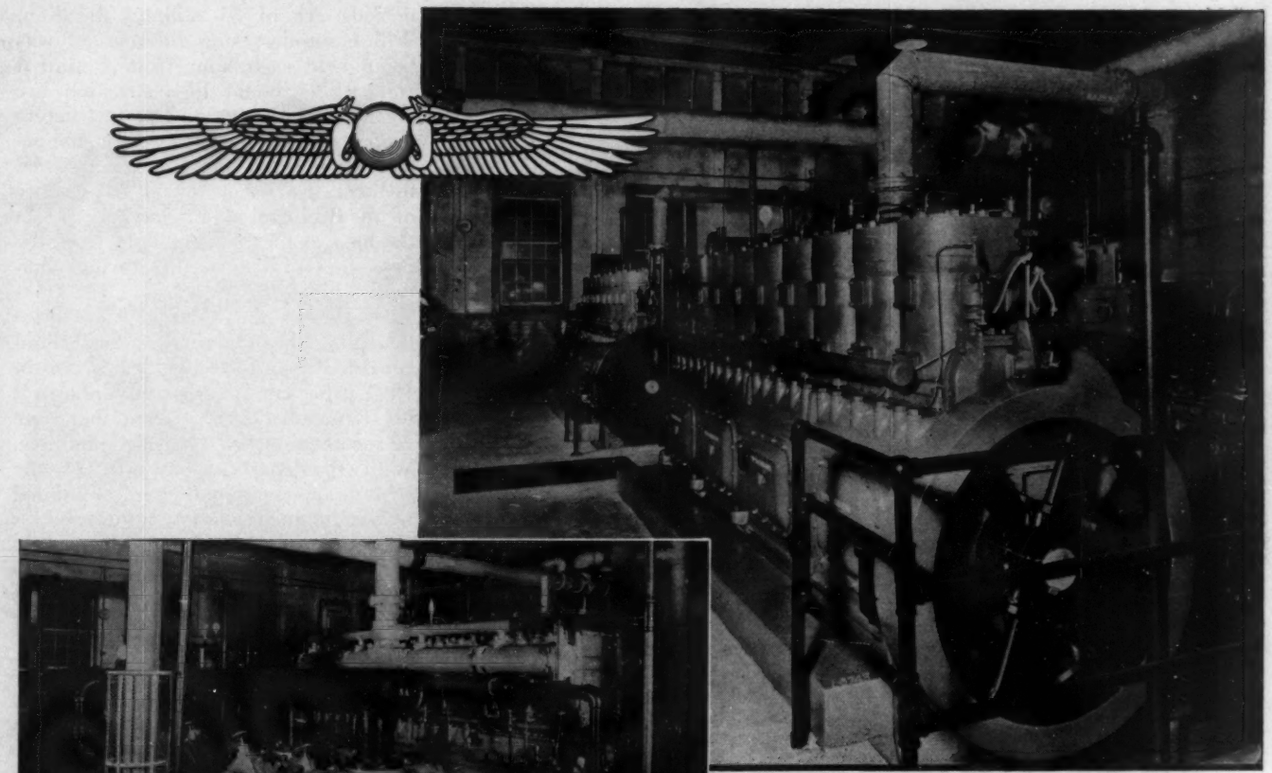
Home Economist Serves Tea

Lucie Lee Carley, home economist of the Fort Worth, Texas, division of the Lone Star Gas System, gives operating instructions to new gas range owners by inviting them to her model kitchen for a cup of tea. Miss Carley makes a small quantity of tea biscuits each day and keeps them in the ice box for quick baking when a guest arrives.

■ ■

Washington Cooking Schools

Clara Nelson has recently joined the home service department of the Washington Gas and Electric Co., Tacoma, Wash., and is conducting cooking schools in Tacoma, Puyallup, Auburn and Sumner, Wash. Her schedule includes two schools a week and demonstrations in stores and markets.



The two Worthington LCE-8 units at Pennsylvania Gas Company's Roystone Station, Ludlow, Pa. Each power element develops 300-hp. at 350 r.p.m. The compressors operate at 50 p.s.i. discharge pressure, and each delivers 3,250,000 cubic feet of gas in 24 hours.

Pennsylvania Gas Company selects Type LCE Worthington Angle Gas Engine Compressors

to modernize and extend its facilities for pumping natural gas to Jamestown, New York, and Erie, Pennsylvania. This recent addition to a fast growing list of Worthington Type LCE installations is but logical recognition of their outstanding features and excellent performance.

Type LCE Compressors are built in units of 75 to 300 horsepower with single or multi-stage compressor cylinders

● ***Literature on request***

GC9-1

PRODUCTS OF
WORTHINGTON
AIR CONDITIONING EQUIPMENT
REFRIGERATION AND ICE PLANT EQUIPMENT
AIR AND GAS COMPRESSORS
STEAM TURBINES
DIESEL ENGINES
GAS ENGINES
CONVERTIBLE GAS-DIESEL ENGINES
CENTRIFUGAL HIGH-PRESSURE BOILER FEED PUMPS
DIRECT-ACTING STEAM PUMPS POWER AND ROTARY PUMPS
DEEP WELL, SUMP, AND DRAINAGE PUMPS
STEAM CONDENSERS AND AUXILIARIES
VACUUM PUMPS
STEAM-JET EJECTORS
PORTABLE COMPRESSORS AND AIR TOOLS
For street . . . trench . . . conduit service
V-BELT DRIVES LIQUID METERS

WORTHINGTON PUMP AND MACHINERY CORPORATION

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DENVER DETROIT EL PASO HOUSTON KANSAS CITY

General Offices: HARRISON, NEW JERSEY

Representatives in Principal Cities of Foreign Countries

LOS ANGELES NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PAUL SAN FRANCISCO SEATTLE TULSA WASHINGTON

View of the permanent gas measurement laboratory at the University of Oklahoma, Norman, Okla.

The Norman Meter School—A Record of its Progress

By DEAN W. H. CARSON
The University of Oklahoma, Norman, Oklahoma

IN 1923 W. H. Crutcher suggested to members of the Oklahoma Utilities Association that a gas meter school be held at the University of Oklahoma for all persons interested in gas measurement.

A number of men became interested in Mr. Crutcher's suggestion, and in 1924 the first gas measurement short course, known as the Oklahoma Gas Meter School, was conducted by the College of Engineering at the University of Oklahoma, Norman, Okla. Cosponsors of the course were the Oklahoma Utilities Association, the Oklahoma Corporation Commission and the university. John H. Baxter organized the program of the first meter school. He was also general chairman of the school for the years 1924, 1925 and 1926. Evidently the men of the industry had had trouble in the repair and maintenance of tincase meters, as the greater part of the program of the first school was devoted to that subject.

During the second and third years of the school, more time and attention were given to the study and operation of the wet gas meter and proportional meter. During the third year manufacturers were invited to display gas measurement equipment at the short course to be used for educational purposes. At this time classes were organized to acquaint the gas measurement men with the physical laws governing the flow of gases.

In 1927 the name of the school was changed from Oklahoma Gas Meter School to the Southwestern Gas Meter School. A year or two later the title of Southwestern Gas Measurement Short Course was adopted.

The attendance at the first school was about 60 persons; however, the attendance has increased each year until in 1938 it was over 500. The short course has attracted many persons from other states as well as from every part of Oklahoma, and at one of the schools a compilation of registration records showed that 27 states were represented.

The proceedings of the short course were first printed in 1926. Since that time it has been the practice to publish a bulletin every two years.

The present plan of procedure for offering instruction during the three-day short course is to have all persons in attendance assemble in the engineering auditorium in the morning to hear talks and enter into discussions on subjects of a general nature; classroom instruction on specialized subjects is offered during the afternoon. Class periods are of 55 minutes duration. With eight classes on different subjects being held each hour from 1 until 4 o'clock, 24 hours of instruction are given each afternoon. The instructors for classroom work, who are competent teachers of the subjects assigned to them, are selected from the faculty of the College of Engineering, from the men of the industry, and from the personnel of the manufacturing companies.

Originally the General Committee managing the operation of the school consisted of only eight persons, but in 1927 it became necessary to enlarge it to 18 members. At present there are 22 members of the General Committee. With the continued growth of the school, sub-committees were appointed to handle such phases of the school's operation as local arrangements and banquet, program, registration, exhibits, and publication. A sixth committee is known as the Committee for Study of Practical Methods.

To stimulate interest among those attending the short course, the General Committee annually awards seven cash prizes. Each contestant is required to write a report on "What I Learned at the Gas Measurement Short Course." First prize is $15, second $10, and $5 is awarded for each of the next five winning reports. The reports must not exceed 500 words in length, and must be confined to the above subject. They are judged primarily on the basis of the interest shown in and knowledge gained from the short course, so that the literary man has no advantage over the practical man. This year these essays should be mailed to the author at the University of Oklahoma by June 1.

■ ■

Power Commission Extends Gas Export Authorities

Finding that additional time is required to give consideration to the various applications for authorization to export natural gas to a foreign country, the Federal Power Commission has extended to July 20, 1939, the temporary authorizations previously granted to the following companies:

United Gas Pipe Line Co. and United Gas Corp., Houston, Texas; El Paso Natural Gas Co. and Texas Cities Gas Co., El Paso, Texas; Texas Gas Utilities Co., Del Rio, Texas; and Iroquois Gas Corp., Buffalo, N. Y.

The Texas utilities have been transporting natural gas into Mexico; the Iroquois Gas Corp. to the Province of Ontario, Canada.

■ ■

Carson City Votes Franchise

A 30-year franchise for supplying natural gas to Carson City, Mich., has been granted Edward C. Dailey of Flint, Mich., in a special election held recently by the people of Carson City.

HELPS GAS DO THE "4 BIG JOBS"

YOUR strongest selling point on gas appliances . . . for heating, cooking, refrigeration or hot water . . . is their reliability. But that promise must be backed up with an installation that gives completely satisfactory service under any conditions. When it comes to venting systems, it will pay you to check up on J-M Transite Flue Pipe. You'll find its long life and freedom from upkeep are important factors in keeping customers sold on the dependability of gas.

Made of asbestos and cement, Transite is completely fireproof . . . fully approved by the National Board of Fire Underwriters. It is highly resistant to weather and corrosion, and its low conductivity minimizes temperature drop in stacks. Transite Flue Pipe is supplied in a complete line of fittings, a full range of sizes. Installations are easily and rapidly finished—even in cramped working quarters.

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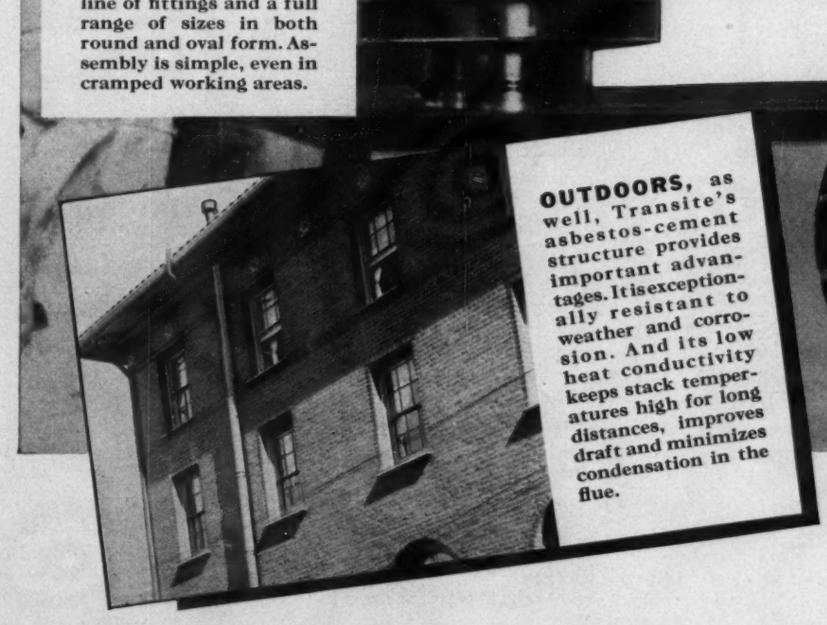
JM JOHNS-MANVILLE TRANSITE FLUE PIPE

RAPID INSTALLATION is made possible by the light weight of J-M Transite Flue Pipe. It is easy to handle, is supplied in a complete line of fittings and a full range of sizes in both round and oval form. Assembly is simple, even in cramped working areas.



OUTDOORS, as well, Transite's asbestos-cement structure provides important advantages. It is exceptionally resistant to weather and corrosion. And its low heat conductivity keeps stack temperatures high for long distances, improves draft and minimizes condensation in the flue.

INDOORS, the asbestos-cement composition of J-M Transite Flue Pipe substantially reduces fire hazard . . . provides continued freedom from high maintenance charges.

Southwestern Short Course Holds Successful Session

By O. D. HALL

Staff Correspondent

THE Southwestern Gas Measurement Short Course, at Norman, Okla., April 18, 19 and 20, was characterized by its officers as the biggest and best in the 15 years of its history. Total enrollment reached 537 and there were 46 more paid registrations than at any previous school, according to L. G. Rheinberger, chairman of the general committee.

Several additional classes were added to those appearing on the program, and some of the classes were repeated upon urgent request of attendants. As in former years, the school was sponsored by the College of Engineering, University of Oklahoma, at Norman, of which W. H. Carson is dean. Dean Carson also served as chairman of the banquet, entertainment and local arrangements committee and was toastmaster at the annual banquet Wednesday evening.

Chairman Rheinberger presided over the general assembly meetings, held in the auditorium of the engineering building, each forenoon. From 17 to 25 classes were conducted each of the three afternoons, the instructors being engineers and other representatives of oil, gas, machinery and equipment companies and members of the University of Oklahoma engineering faculty. More than half of the states of the union had representatives at the school. Old Mexico also was represented. Howard S. Bean, National Bureau of Standards, Washington, D. C., also was present and was introduced at the general assembly.

The address of welcome was delivered by Dr. M. L. Wordell, assistant to the president, in the absence of Dr. W. B. Bizzell, president, University of Oklahoma.

Characterizing the oil and gas industry as a business with a big "B," William F. Lowe, secretary Natural Gasoline Association of America, enumerated a number of new products manufactured from natural gas, including artificial silk for women's hose and other garments.

E. H. Poe, secretary, Natural Gas Section, American Gas Association, New York City, a former resident of Oklahoma, declared that it is the company employe's duty to properly represent the capital behind him by learning more about his job. He called attention to some of the many employe courses offered in the gas industry and said that any of these can be completed with three hours a week study.

In his report of the committee for the study of practical methods, Earl Kightlinger, Arkansas Louisiana Gas Co., Shreveport, La., stated that for the past three years his committee has been making a study of "Pilot Operated Regulators," and is now making up its report.

At the Wednesday morning session Chairman Rheinberger reported the winners of the seven cash prizes awarded for writing reports on "What I Learned at the Gas Measurement Short Course." These were: Edward Sackett, Southern Carbon Co., Fairbanks, La., first prize, $15; B. H. Fowler, Phillips Petroleum Co., Bartlesville, Okla., second prize, $10; W. J. St. John, La Del Oil Properties, Inc., Monroe, La., Sible McKay, Victor Gasoline Co., Tulsa, Okla., J. D. Riley, Arkansas Louisiana Gas Co., Shreveport, La., L. Dupree Foy, Magnolia Petroleum Co., Dallas, Texas, and W. R. Pike, Cities Service Gas Co., Bartlesville, Okla., third prizes of $5 each.

In a paper on the "Fundamental Principles of Orifice Meters," L. K. Spink, Foxboro Co., Foxboro, Mass., explained several methods of testing such meters and how they should be properly placed and connected.

A. D. McLean, Pittsburgh Equitable Meter Co., Pittsburgh, Pa., presented an address, illustrated by slides, on the "Fundamental Principles of Displacement Meters." He described the various causes of errors in measurement and outlined the principles of construction and uses of tin and iron meters.

During the Thursday morning general assembly, Chairman Rheinberger announced that Fay C. Walters, superintendent of gas measurement, Panhandle Eastern Pipe Line Co., Kansas City, Mo., had been elected chairman of the general committee of the Southwestern Gas Measurement Short Course for the 1940 school, and that all other members of the general committee had been re-elected.

Walters served as chairman of the program committee for the 1939 course. Born in Ohio, he was educated at the University of Kansas, is a graduate chemical engineer and served in the World War. From 1921 to 1931 he rose from a meter employe to responsible positions in the Oklahoma Natural Gas Co., Tulsa, Oklahoma, and in 1931 went to the Panhandle Eastern Pipe Line Co. He has been a member of the general short course committee for 11 years. The new chairman announced that he had appointed R. M. Scofield, Lone Star Gas Co., Dallas, Texas, to be chairman of the practical methods committee.

Blanchard Smith, Reynolds Gas Regulator Co., Anderson, Ind., substituted for Ralph C. Hughes, of the same company, in presenting the subject, "Fundamental Principles of Regulators," at the Thursday assembly.

"The Behavior of Gases Under Abnormal Conditions" was the subject presented by R. L. Huntington, University of Oklahoma faculty. He described the universe as being largely a combination of gases, stating that an 80,000-barrel tank, containing elements of the universe, would include only one molecule of solid matter. He said that the gas industry, to date, had only produced 500 to 1000 cubic miles of gas.

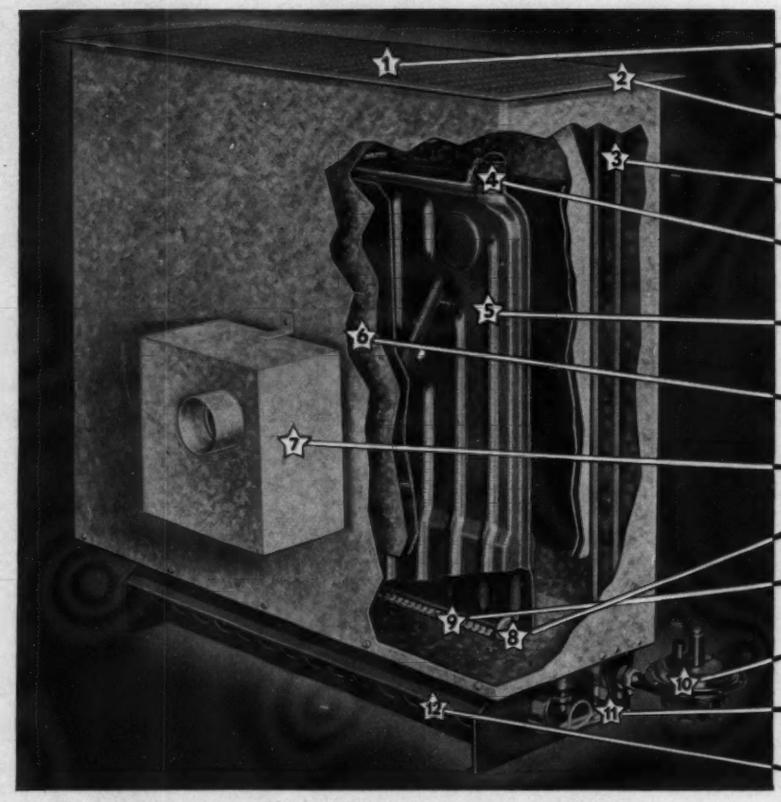
Leakage Losses Discussed

In a Thursday afternoon class, D. H. Tucker, El Paso Natural Gas Co., El Paso, Texas, described three principal methods of determining leakage losses in high pressure lines—the pressure drop, the metering in, and the metering in and metering out methods.

Another paper, which attracted much attention at the Thursday afternoon session, was delivered by S. R. Beitler, of the Ohio State University, Columbus, Ohio. He substituted for J. E. Overbeck, Columbia Engineering Corporation.

In addition to the University of Oklahoma College of Engineering, the following organizations sponsored the short course: Corporation Commissions of Oklahoma and Kansas, Railroad Commission of Texas, Oklahoma Utilities Association, Natural Gas Section of the A.G.A., and Natural Gasoline Association of America.

Miss Kate A. Niblack, Oklahoma City, chairman of the registration and publicity committee, is the only woman member of the general committee and has been connected with the short course since its beginning. She was assisted at the registration desk by Miss Thelma Jones and several university students.



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2. Unit controlled from beneath removable section of grille—easily accessible.
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1 Mueller introduces FLOR-AIRE—a Gas Floor Furnace with the superior features which the trade has learned to expect from Mueller design and manufacture. Even a quick glance at this remarkable unit tells the experienced heating man that it stands for high efficiency, volume sales, and customer satisfaction. Note narrow vertical section designed to improve circulation. Investigate this new unit today.

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Climatrol, Mueller's Air Conditioning Gas Era Furnace heats, filters, humidifies and circulates the air within the home.

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Appliance Servicing Topic At Distribution Conference

By CRAIG ESPY
Assistant Publisher, GAS

APPLIANCE Servicing was given the place of prominence on the program of the 16th Annual Distribution Conference held in Chicago April 17, 18 and 19, and attended by 450 gas men. Three papers were read on the subject the first day.

J. J. Perry, The Brooklyn Union Gas Co., led off with a paper on "The Importance of Proper Servicing," pointing out that appliance servicing over a 10-year period had grown in one instance from a point where it represented 10.2 per cent of total charges to a point where it represents 37.2 per cent of total charges. Despite this growth, these costs, he pointed out, now approximate but one-third of total service costs.

J. M. Pickford, Northern Indiana Public Service Co., Hammond, next described the Indiana Gas Association Service Committee's Preparedness Program on the CP Range revolving around work in connection with pressure variations on burner and pilot operation to determine the advisability of using appliance regulators on all CP gas ranges.

The study also covered the pilot light consumption of typical CP ranges. A third phase led to the determination of the fact that no inflammable mixtures were present in the oven or broiler if the constant burning pilot was extinguished and the gas normally used in the thermostatic pilot flame was allowed to escape in the oven or broiler.

Miss Jeanette Campbell, The East Ohio Gas Co., Cleveland, next dealt with appliance servicing from a woman's viewpoint. She pointed out what women expect from their gas company in the way of service and what they expect from their gas appliances as to performance.

Prior to the reading of these papers, C. F. Turner, chairman, had introduced G. F. Mitchell, president, The Peoples Gas Light & Coke Co., and Alexander Forward, managing director, American Gas Association, both of whom brought greetings to the assembled delegates.

Speaking of the prominent position in the industry of gas distribution men, Mr. Mitchell pointed out that the largest investment in the gas utility industry is in its underground services. Mr. Forward prefaced his remarks with interesting facts on gas service in war times, as revealed in the last war, to show that the hazards of war were no greater to the gas industry than to any other business.

Four round-table luncheon conferences centering discussions upon the themes of construction, maintenance, installation and servicing appliances, meters and metering were held the first day. Presided over by L. W. Tuttle, L. J. Eck, W. M. Little and A. W. Fuller, the conferences continued throughout the afternoon. The points of discussion were presented to the general assembly at the closing sessions presided over by C. H. Waring, vice-chairman.

J. W. Martin, Lone Star Gas Co., and president of the Liquefied Petroleum Gas Association, presented a discussion as first speaker on the second day on Rural Gasification Activities. His paper is published in this issue of *GAS*, page 80. At the conclusion of opening remarks he showed a moving picture portraying the rural gasification program of his own company headquartered in Dallas, Texas.

The report of the Committee on Pipe Coatings and Corrosion was brought by A. V. Smith, The United Gas Improvement Co. of Philadelphia with Dr. Scott Ewing, research associate of the National Bureau of Standards, following with a paper on "Half-Cells for Measuring Potentials in the Earth" (see page 44).

K. R. Knapp, A.G.A. Testing Laboratory, presented a paper on the "Significance of A.G.A. Requirements to the Operating Engineer." The program of the second morning ended with the discussion on Mr. Knapp's paper.

At the afternoon meeting E. S. Umstead, of the Providence Gas Co., brought the report of the Memorial Committee, and A. W. Fuller, Consolidated Edison Co. of New York, Inc., the report of the Committee on Meters and Metering. H. S. Harris, Southern California Gas Co., Los Angeles, presented a paper dealing with a "Method of Prognosticating Meter Errors," pointing out as he did so that the paper dealt more with a statistical method for determining meter conditions rather than one for determining meter errors. An inspection trip to see the Year 'Round Air Conditioning System in the Palmer House brought the second day to a close.

Discussion of the "New Law of Design of Cast Iron Pipe for Underground Service" as developed by Committee A-21 of the American Standards Association, by W. D. Moore, president of American Cast Iron Pipe Co., was regarded as one of the most outstanding contributions to the conference. His paper will be abstracted in an early issue of *GAS*.

Immediately preceding Mr. Moore on the program were L. W. Tuttle, who brought the report of the committee on Pipe Joints and Pipe Materials, and C. C. Simpson, Consolidated Edison Co. of New York, Inc., who read the report of the Committee on Cast Iron Pipe Standards.

The convention concluded with an open forum in the afternoon. Among resolutions presented were those extending thanks to The Peoples Gas Light & Coke Co., the host company, for its helpfulness in making the conference a complete success and another thanking the program committee and the general committee for one of the finest programs ever presented.

■ ■

R. B. Brown, President of Wisconsin Utilities, Retires

R. B. Brown, for 40 years connected with Wisconsin utilities, has announced his retirement as president of the Milwaukee (Wis.) Gas Light Co., Milwaukee (Wis.) Coke and Gas Co., and the Madison (Wis.) Gas and Electric Co.

His successor as president of the Milwaukee Gas Light Co. will be Bruno Rahn; president of the Milwaukee Coke and Gas Co. will be J. A. B. Lovett, Hamilton, Ohio; and president of the Madison Gas and Electric Co. will be John St. John.

■ ■

German Gas Ass'n to Send Delegates to A.G.A. Meeting

A group of members of the German Gas and Water Association will make a study tour of the United States from September 26 to October 20, according to information received by the American Gas Association from Dr. Fritz Schuster, director of the German Association.

The delegation will be in attendance at the A.G.A. annual convention in New York, October 9-11, and visits will be made to points in New England, Niagara Falls, Washington, D. C., Cleveland, and other cities.

■ ■

Young Made A.G.A. Director

Percy S. Young, vice-president, Public Service Electric & Gas Co., Newark, N. J., has been elected a director of the American Gas Association. Mr. Young formerly served as president of the association and has been an active worker on many of its committees since the association was organized in 1919.

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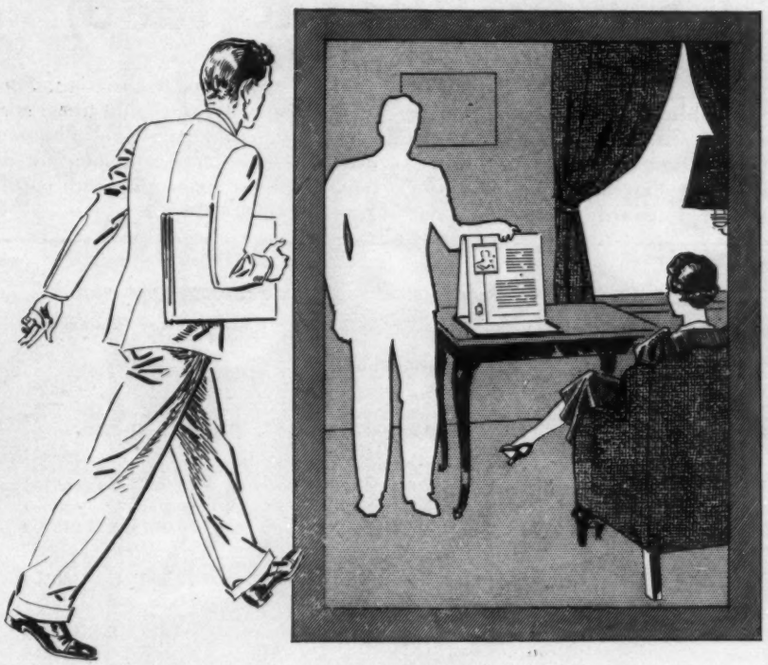

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PITTSBURG
GIVES YOU THE MOST COMPLETE LINE OF AUTOMATIC GAS WATER HEATERS

- **STORAGE MODELS**
  7 sizes with Galvanized Tank.
  Capacities 7½, 15, 20, 30, 40, 50 and 75 gallons.
  5 sizes with Copper Tank.
  Capacities 20, 30, 40, 50 and 75 gallons.
- **LIQUEFIED PETROLEUM HEATERS**
  4 Sizes with Galvanized Tank.
  Capacities 20, 30, 40 and 50 gallons.
- **MULTICOIL STORAGE SYSTEMS**
  4 sizes with Galvanized or Copper Tank.
  Capacities 80 to 5,000 gallons per hour.
- **CONTINUOUS FLOW HEATERS**
  7 sizes—Copper Coil Type
  Capacities 1½, 2, 2½, 3, 4, 6 and 8 gallons per minute.
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  Capacities 2½ and 4 gallons per minute.
- **TANK HEATERS**
  5 sizes—Copper Coil, Cast Iron Jacket.
  Nos. 1B, 1M, 1½B, 1½M and 2.
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EVERY SIZE AND EVERY TYPE OF HEATER FOR EVERY CONCEIVABLE REQUIREMENT

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P.W.A. Allotments for Gas Projects (1933 to 1938)

IN THE table below are listed the Public Works Administration loans and grants for gas projects for the years 1933 to 1938. This list was compiled at the suggestion of Major Alexander Forward, managing director, American Gas Association. Some of the grants are for pipe lines, some for additions to municipal plants or distribution systems, and some for distribution lines connecting with natural gas pipe lines.

P.W.A. NON-FEDERAL ALLOTMENTS FOR GAS PROJECTS (1933-1938)

Location	*Type of Project*	*Total Allotment**
Alabama		
Andalusia	Manufactured Gas Distribution	$ 73,700 L & G (30%) *
Ozark	Manufactured Gas Distribution	49,091 L & G (45%)
Troy	Manufactured Gas Distribution	75,000 L & G (30%)
Arizona		
Benson	Natural Gas Pipe Line & Distribution	35,000 L & G (45%)
Mesa	Additions to Natural Gas System	14,500 G (30%)
Tombstone	Natural Gas Distribution	26,000 L & G (45%)
California		
Palo Alto	Additions to Manufactured Gas System	12,700 G (30%)
Florida		
Clearwater	Additions to Manufactured Gas System	105,869 L & G (45%)
Plant City	Manufactured Gas System	82,500 L & G (45%)
Sebring	Manufactured Gas System	63,636 L & G (45%)
Illinois		
Bushnell	Manufactured Gas Distribution	64,320 L & G (30%)
Carrolton	Natural Gas Transportation & Distribution	73,000 G (45%)
Pittsfield	Natural Gas Distribution	34,363 G (45%)
Roodhouse	Natural Gas Distribution	70,000 G (45%)
Rushville	Manufactured Gas Distribution	72,000 L & G (30%)
Whitehall	Natural Gas Distribution	66,000 G (45%)
Indiana		
Linton	Natural Gas Pipe Line & Distribution System	79,000 L & G (30%)
Mt. Vernon	Manufactured Gas System	60,000 L & G (45%)
Iowa		
Webster City	Additions to Manufactured Gas System	17,000 G (45%)
Kansas		
Canton	Natural Gas Distribution	16,650 G (45%)
Hesston	Natural Gas Distribution	12,727 L & G (45%)
Hillsboro	Natural Gas Distribution	22,050 G (45%)
Kentucky		
Henderson	Natural Gas Distribution	90,818 G (45%)
Louisiana		
Delcambre (Includes towns of Iberia and Vermillion)	Natural Gas Distribution	29,090 L & G (45%)
Zachary	Natural Gas Distribution	16,000 L & G (30%)
Mississippi		
Canton	Natural Gas Transportation & Distribution	196,000 L & G (30%)
Centerville	Natural Gas Distribution	37,500 L & G (45%)
Vicksburg	Natural Gas Pipe Line	300,000 L & G (45%)
Missouri		
Fulton	Natural Gas Distribution	86,000 L & G (30%)
Havre	Natural Gas System	163,636 L & G (45%)
Nebraska		
Omaha	Additions to Manufactured Gas System	290,256 G (30%)
New Mexico		
Denning	Natural Gas Distribution	40,000 L & G (45%)
Las Cruces	Natural Gas Distribution	186,800 L & G (30%)
Lordsburg	Natural Gas Distribution	44,000 L & G (30%)
Texas		
Benevides	Natural Gas Distribution	45,454 L & G (45%)
Houston	Additions to Natural Gas System	25,700 G (30%)

*The figure given here is the total loan and grant, or grant, from the P.W.A. The figure in parentheses indicates the percentage of the grant. (1933-1938 inclusive.)

Tomball Field Supplies Gas To Southern Union System

THE Southern Union Utilities Co., Dallas, Texas, has recently completed a 6-in., 22-mile pipe line to Prairie View, Waller County, Texas, in order to connect their South Texas System to the prolific Tomball gas field in Harris County. This field has an estimated reserve of 555 billion cu. ft.

In order to make the connection, it was necessary to reduce a 2050 lb. pressure at the gas wells to a safe line pressure, and to secure right-of-way grants from 65 landowners. The pipe for the line was shipped by water from Youngstown, Ohio, to Houston, Texas, and the actual stringing began November 26, 1938. Using the fleet process of welding, each of four men was able to make as high as 62 six-in. welds per day.

When the pipe was welded, a painting machine applied first a coat of primer and then a coat of coal tar enamel 1/16-in. thick, heated to a temperature of from 375 to 425 degrees F. The trench was then backfilled immediately so that the brittle enamel coating would not be damaged by expansion and contraction of the pipe under temperature changes. Plug valves were installed in the line every five miles, with blow-off valves on either side.

All operations, except testing, had been completed on December 20, 1938. The test was made by placing 400 lbs. pressure on the line for 48 hours, proving the line was "bottle tight."

■ ■

FHA Specifies Appliances Bearing A.G.A. Approval Seal

Gas appliances bearing the Approval Seal of the American Gas Association's Testing Laboratories have been specified by the Federal Housing Administration for its housing projects. These specifications make it mandatory that gas appliances shall conform to the standards established by the Association. The FHA states that the approval seal of the Association's Testing Laboratories or certification of compliance with the approved standards of the Association shall constitute evidence of compliance.

More than 93 per cent of all domestic gas appliances sold in the United States have been tested and approved by the Association's laboratories in compliance with national requirements.

■ ■

Lone Star Promotes Shepherd

A. C. Shepherd, formerly in the accounting department of Lone Star Gas Co., Fort Worth, Texas, division, has been named purchasing agent for the division, it was announced by F. L. Carmichall, manager. Mr. Shepherd succeeds J. C. Williams, who resigned to become California representative for Globe Laboratories.

■ ■

Empire Co. Shifts Managers

R. W. Adams, for 11 years manager of the Clarksville, Ark., branch of the Empire Southern Gas Co., has been transferred to the office at Minden, La. C. C. Redding of Big Spring, Texas, will succeed Mr. Adams at Clarksville.

ONE GAS RANGE HAS EVERY NEWEST REFINEMENT!

Patented "LIFETIME" COOKING CHART

Exclusive Staggered TOP BURNER ARRANGEMENT

"Simmer-Speed" TOP BURNERS AND MANY OTHERS

BIG "3-in-1" Easy-Clean OVEN

"X-RAY" OVEN with ELECTRIC OVEN LIGHT

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ROPER GAS RANGE

Shown above is the New Roper "Sheffield" featuring the Extra-Capacity Handy-High Astogril Roll Broiler

THERE'S A ROPER

for Every Home and Every Purse

Particular customers SHOP gas ranges . . . they compare feature for feature, improvement for improvement. When you show them ROPER for 1939 you'll have "ALL the answers," for this superb line of gas ranges has ALL of the refinements! That's why dealers who feature ROPER this year will find more prospects than ever turned into SALES.

The above features are only a few of the many ROPER refinements. Other developments include "Giant Simmer-Speed" Burner, "Simmer-Speed" Burner, "3-in-1" Oven, "Lifetime" Cooking Chart, Extra-Capacity Handy-High Astogril Roll Broiler, "X-Ray" Oven with Electric Oven Light, "Insta-Flame" Top Lighter, "Insta-Flame" Oven and Broiler Lighter, and "Turret Top." These features help create the all-important ROPER factor of SALABILITY-PLUS!

It's ROPER *Again* FOR 1939

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ROPER RANGES ARE IDEAL FOR USE WITH ANY TYPE OF GAS, INCLUDING BOTTLED GAS

Southern Ass'n Ship Cruise Convention Lures 300

ABOUT 300 representatives of the Southern Gas Association and the Southern-Southwestern Regional Gas Sales Conference of the Commercial Section, A. G. A., cruised to Havana aboard the *S.S. Rotterdam*, March 19-24. During the six-day voyage, convention sessions were held under the direction of H. G. Bonner, Association president, and S. L. Drumm, secretary-treasurer. Dinners, concerts, movies, and deck sports entertained the delegates when the conferences were not in session.

C. H. ZACHRY

At the business session C. H. Zachry, vice-president and treasurer of the Southern Union Gas Co., Dallas, Texas, was elected president of the Association; S. L. Drumm, New Orleans Public Service, Inc., was re-elected secretary-treasurer; C. B. Wilson, Arkansas Natural Gas Co., Little Rock, was elected first vice-president; and H. Carl Wolf, Atlanta (Ga.) Gas Light Co. was elected second vice-president.

Conrad Lauer, president, A.G.A., opened the sessions with a history of the gas business and a forecast of what the industry could accomplish in the future. At the general sessions C. H. Zachry presented the report prepared by the committee on business progress, W. H. McInnis, chairman; an explanation of the Federal Natural Gas Act was presented by E. Holley Poe, secretary. Natural Gas Section, A.G.A., and Merrill N. Davis, Dresser Manufacturing Co., spoke on gas company and manufacturer coordination. The home service representatives took charge of part of one of the general sessions, Marian Dow, New Orleans Public Service Co., presiding. Jane Tiffany Wagner, Servel, Inc., Louise Anderson, Oklahoma Natural Gas Co., Tulsa, Betty Lynahan, Peoples Gas Light & Coke Co., Chicago, and Mildred Clark, Oklahoma Natural Gas Co., discussed various phases of home service. A motion picture entitled "Never So Embarrassed," was presented by Albertine Berry, Lone Star Gas Co., Dallas.

On two afternoons during the cruise the residential, industrial, sales and technical committees held conferences.

■ ■

C. A. Tattersall To Head A.G.A. Publicity Committee

C. A. Tattersall of New York, secretary of the Niagara Hudson Power Corp., has been elected chairman of the publicity and advertising committee and a member of the executive board of the American Gas Association. He succeeds Henry Obermeyer, assistant vice president of the Consolidated Edison Co. of New York.

Mr. Tattersall has been with Niagara Hudson Power and its affiliated companies for more than 30 years, serving at various times as assistant to the vice president and general manager of the Niagara Falls Power Co., assistant to the president of the Buffalo, Niagara and Eastern Power Corp., vice president of the corporation, assistant vice president of Niagara Hudson, and finally secretary. He is director and vice president of the American Management Association and a member of the Empire State Gas and Electric Association.

■ ■

Natural Gas Being Served To Beaumont Industries

The Beaumont Natural Gas Co., Beaumont, Texas, has begun serving natural gas from the West Beaumont oil field to industrial consumers in Beaumont. The company's franchise includes serving gas to domestic consumers as well, but according to Glenn H. McCarthy, president, the company will limit its service to industrial users until conditions warrant entering domestic fields.

James A. Clark, former oil editor for the *Houston Press*, has been named resident manager for the company. Other officers are George B. Morgan, vice-president, and I. E. Burton, plant superintendent.

■ ■

Condit Joins Cooper-Bessemer

Paul A. Condit, formerly with the Mason-Neilan Regulator Co., has recently joined the Cooper-Bessemer Corp., Mount Vernon, Ohio, as control engineer. Mr. Condit will work on control system problems with the sales and engineering departments.

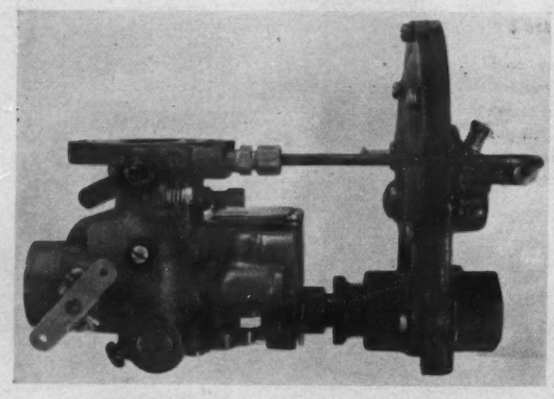
Mr. Condit attended Denison, Ohio Northern and Cincinnati Universities.

■ ■

Edison Co. Employe Dies

Clifford de Peyster Appleton, 46, supervisor of the commercial cooking department of the Consolidated Edison Co. of New York, died March 17 at his home in Larchmont, N. Y.

ENSIGN
CARBURETION
EQUIPMENT



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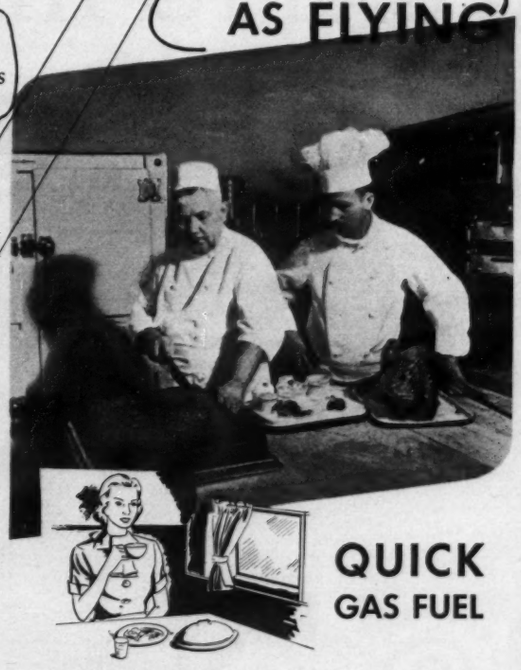
P.C.G.A. PREVIEW

COOPERATIVE LOAD-BUILDING

"FOLKS FLY THROUGH THE AIR WITH THE GREATEST OF EASE —AND ENJOY GAS COOKED MEALS THAT ARE CERTAIN TO PLEASE."

AS MODERN AS FLYING



QUICK GAS FUEL

United Air Lines' delicious food (served aloft in planes leaving S. F. Bay Airports) is gas-cooked in the Company's efficient Oakland Commissary. Meals are prepared to meet flight schedules and kept piping hot on board. ★ Just as air travel is fastest, gas cooking is quickest, most efficient. Cut corners and costs in *your* kitchen with modern gas equipment. ★ Your Gas Company offers free technical advice based on long experience.

SAN FRANCISCO FAIR VISITORS: See the fascinating $150,000 Gas Exhibit on Treasure Island—located in the Homes and Gardens Palace.

United Air Lines' Oakland kitchen has a heavy-duty range, bake oven, coffee machine and water heater—all gas. *Maitre d'Airline* Magarrell says: "Gas is the most efficient and economical fuel for our purpose."

QUICK · CLEAN · CONTROLLABLE · GAS · THE MODERN FUEL · DEPENDABLE · ECONOMICAL

This ad, for hotel and restaurant magazines, features United Air Lines' all-gas kitchens.

P. C. G. A.
H. L. Farrar, President
Clifford Johnstone, Managing Dir.

MAY
1939

COMMITTEE
A. C. Joy, P. G. & E.
J. S. Spaulding, So. Calif. Gas Co.

BUTANE-PROPANE *News*

TAKING GAS TO THE COUNTRY

WHY should "Rural Gasification Activities" be of interest to men and women already engaged in a natural or manufactured gas business? Possibly the answer lies in the following conditions.

First, a vast rural market exists for a gas service. Based on the 1930 federal census, it has been estimated that there are 15,000,000 families throughout the United States who are without gas service. This, in terms of population, amounts to about 75,000,000 people, which is approximately half the population of the United States. This market is becoming more and more conscious of gas as a fuel and is rapidly applying gas to its household and industrial needs. The following figures bear testimony to this fact:

Gallons of Liquefied Gas Used	
In 1922	222,641
In 1927	1,091,005
In 1932	34,114,787
In 1937	141,505,000
In 1938	157,000,000

In 1927 there were less than 50,000 users. In 1937 there were approximately 400,000 active domestic customers using some liquefied gas service. In 1938 this number increased to well over 500,000.

Phenomenal Growth

In good times this growth (1927-1938) would be a record of some sort. When consideration is taken of the country-wide economic conditions that did prevail during the greater part of this period, this growth of a new industry definitely points a way to new and larger gas loads and new and larger gas revenues.

Second, an abundant supply of fuel, namely, propane and butane, is available for rural gasification activities, and is as close at hand as natural gas and refined petroleum products. The sources of supply are the petroleum refineries and natural gas gasoline plants. Texas, California, Oklahoma, Louisiana, Kansas, Arkansas, Kentucky, West Virginia, Pennsylvania, and others to a lesser degree, are the states in which an abundance of these fuels are available, and in which the refineries and natural gasoline plants for supplying the finished product are already in operation.

• J. WOODWARD MARTIN, manager Stargas Department, Lone Star Gas Co., Dallas, Texas, in a paper, "Rural Gasification Activities," presented before the American Gas Association Distribution Conference, Chicago, Ill., April 17-19, 1939. —(Abstract by GAS)

J. W. MARTIN

Third, the various utilization equipment, ranges, water heaters, refrigerators and all types of house heating equipment, constructed specifically for the gases used in rural service, are already in production by the same concerns that supply the utilization equipment for natural gas service.

Fourth, the various equipment needed to provide service and the manner and methods of rendering service have been developed to such a point that the service rendered to rural customers by some companies in the business equals the best provided by conventional gas distribution systems and excels any others not up to the highest standard.

Fifth, the existing gas companies are established and doing business in the very middle of this market. The source of supply of the fuel is close at hand. All of us are engaged in merchandising gas appliances and already have sales organizations, display floors, appliance stocks and sales experience. Service equipment has been developed and service methods devised and proven whereby gas service can be rendered to this rural market. Such equipment and methods are at our command to use. With additions to capital account and with but slight additions to present personnel, these existing gas companies are in position to easily expand their services into their surrounding rural districts.

There are many different conditions to be met in rendering rural gas service in the various parts of the country. Weather conditions, the occupations and living habits of the people, and the cost of competitive fuels are different in one part of the country from those in another part—all have their effect on the very nature of the rural gasification activity in the particular territory. In the North and East, rural gasification activities are confined principally to cooking, summer water heating when the furnaces are out of use, and refrigeration. The costs of manufactured gas and electricity constitute the standards by which other fuels for these same services are compared. The severity of the winter weather in the North and East, coupled with the comparative cost of gas services and competitive fuels, prevent gas from being the predominating heating fuel in straight manufactured gas territories.

Rural House Heating

In the southern and southwestern states, winters are comparatively mild, and room heaters, regardless of the fuel used, predominate. Natural gas, where available, sets the standard for fuel costs for all household heating services, including house heating. For a rural gas service to be complete and meet the expectations and requirements

of the rural user adjacent to the natural gas user, such service must also be at such cost that it can be applied to the full heating needs of a rural home, including the house eating needs.

There are also many differences of opinion among the individuals engaged in rural gasification activities in a particular territory as to the best methods and equipment to meet their particular conditions. The author's experience has been confined to the Southwest, principally Texas; and for these reasons these remarks are confined to the rural gasification activities as they are carried on in the South and Southwest. Small towns using these same fuels delivered to the customer from central bulk stations by pipe distribution systems similar to natural and manufactured gas distribution systems will not be discussed. The rural gasification activities under consideration are those involving individual gas plants or gas tanks for each customer.

The particular fuels used in rendering gas service to the rural markets in the southern states are commercial propane, commercial butane and, in some cases, mixtures of the two. They are stored, transported and delivered in liquid form but utilized as a dry gas. We are all, more or less, familiar with the "bottled gas" type of service. In this service, propane is the fuel that is used most generally. This type of service has been on the market since about 1916. However, due to its cost, necessarily high because of the high cost of distribution, only a modest acceptance on the part of the rural market was experienced by it. About four years ago certain interests and individuals, in Texas particularly, became interested in the use of butane as a fuel for this rural market, and development work started on the proper methods and equipment needed to serve butane as a gas to this rural market.

Two General Types

There are two general types of businesses engaged in rural gasification activities in the South and Southwest at this time. One is a "merchandising type," the other a "gas utility type."

In the merchandising type of business, the controlling motive is the profit from the sale of the tanks and appliances with but secondary importance placed on the sale of the gas itself, or on the gas service provided to the customer. In many cases the fuel service is actually divorced from the sale of tanks and appliances and is carried on by an entirely different organization. In territories where the market is "lean," justifying only one distributor, or in more fertile territories where several firms are engaged in the sale of tanks and appliances, the same organization must engage in the fuel or butane business in order to sell the tanks and appliances. The particular merchant engaged in the business sells all equipment installed on the customer's premises to the customer, in the same manner that carbide plants, individual electric plants, etc., have been sold to this market for years. Such type of business handles the underground, or buried, type of customer unit entirely. The only investment this type of business requires is in a tank truck or two and in some cases, in a bulk storage tank. The customer bears all other investments. There are a few instances, however, where some individuals engaged in this business are leasing or renting the customer's unit of the underground type, but such are rare in the South and Southwest.

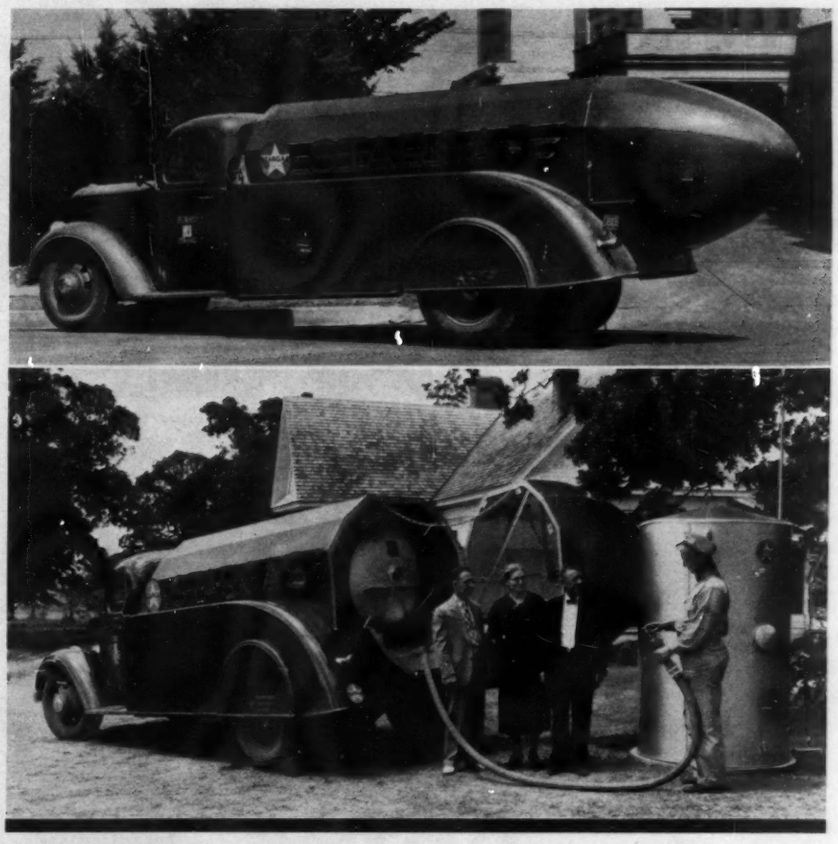
In the gas utility type, the motive, of course, is the profit from the gas service itself—the same as with any other gas utility enterprise. All equipment necessary to provide a continuous supply of fuel to the customer's yard line is furnished and maintained by the service organization—the same as is done in conventional pipe line services. The aboveground type of customer unit is used in this type of business for obvious reasons. As this equipment represents an investment on the part of the company, every means must be employed to insure a long life —which means that underground soil corrosion must be avoided; which means that it must be designed and constructed to permit periodic inspections at low cost; it must be safe because it is company property installed on customer's premises.

An Active Investment

The above ground investment can be kept more active at less cost because it can be moved from one house, that may become vacant, over to an active account with very little trouble and expense. Also, it must handle all types of customers with perfect satisfaction under all conditions, and must be low in initial cost.

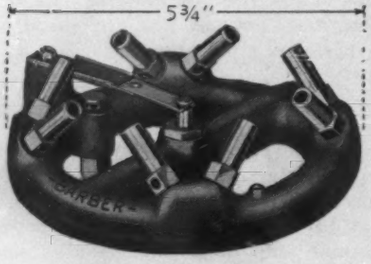
The appliances must be specifically designed and constructed for use with butane with the same accuracy as for manufactured or natural gas. Natural

(Continued on Page 84)



ABOVE: A view of one of the new streamlined, 981-gallon capacity New Stargas trucks now in service for rural customers. BELOW: A New Stargas service man demonstrates the method of filling the customer's tank to a couple at their country home, which will be served with the fuel for cooking, refrigerating, and heating purposes.

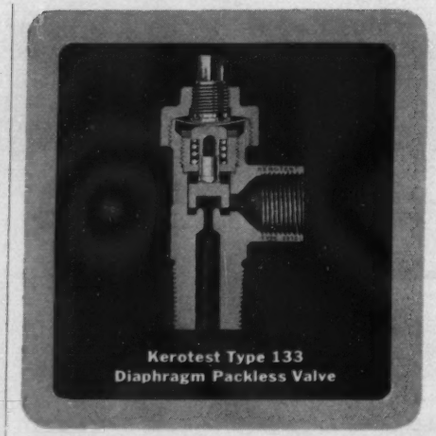
For BUTANE Gas
You Can Rely On
BARBER
Appliance
BURNERS



No. S. P.-15 Barber Burner
with Safety Pilot

Any gas-burning appliance can be equipped with a Barber Burner with special drilled jets to meet the requirements of Butane Gas. Servicing and backfiring are eliminated. There's a proper, reliable Barber unit for every size and type of appliance — and Barber means top efficiency. Write for complete literature, prices and discounts on the Barber line of Conversion Burners, Appliance Burners, Controls and Regulators.

The Barber Gas Burner Co.
3704 Superior Avenue Cleveland, Ohio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Diaphragm Packless Valve

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the ideal valves for
modern propane gas service

Incorporating the famous Kerotest Diaphragm Packless design, these strong, pressure-tested valves can be inspected or repaired while under full pressure without interrupting service from the line—thus extending their service indefinitely They are listed as standard by the Underwriter's Laboratories and are available with or without handwheels. Try them on your next job.

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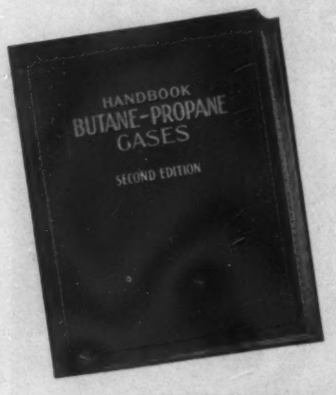
PITTSBURGH, PA.

HANDBOOK
BUTANE-PROPANE
GASES



415 Pages

CONTENTS: Semi-Bulk Distribution: Use of Butane in Buses: Combination Propane Operated Utility Plant: Use in Internal Combustion Engines: Design & Installation of Storage: Supply from Petroleum Refineries: Engineering Data on the Lower Olefins: Domestic Appliance Testing and Utilization: Economical Comparisons with Coal, Oil, Electricity, Producer Gas, Manufactured Gas: Town Plants: Manufacture from Natural Gas: Special Uses: Volume Correction Factors: Transportation: Use with other Gases: Analysis & Testing: Properties of Mixtures: Bottled Gas Distribution: Bibliography: Central Plant Directory: Catalog Section.

SECOND EDITION (Revised November, 1938)

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GAS
The NATIONAL Gas Magazine

OIL & GAS
Equipment Review,
810 S. SPRING ST.
Los Angeles, Calif.

Childs, Pioneer in Fueling Buses With Butane, Dies

R. B. CHILDS, assistant general manager, Washington Water Power Co., Spokane, Wash., passed away March 31 at the age of 51. He had been in declining health since the first of the year.

R. B. CHILDS

As part of his duties, Mr. Childs managed the Spokane United Railways properties, which operate a bus transportation system in Spokane. It was his foresighted judgment and courage in experimentation in converting this bus system to butane fuel that established him as a widely recognized authority on the utilization of liquefied petroleum gases in bus transporation systems. Due to his efforts along these lines, the Spokane bus system became the first municipal transportation unit to adopt the 100 per cent use of butane fuel.

The progress and the results of Mr. Childs' experimentation in this field have been recorded in this publication (see *G A S*, March, 1937) and in the *Handbook Butane-Propane Gases, Revised Second Edition.*

■ ■

Proceedings of Appalachian Short Course Published

R. S. Reed, Jr., chairman of the publicity committee of the Appalachian Gas Measurement Short Course, has announced that the Proceedings of the first annual short course, held August 22, 23 and 24, 1938, are now ready for distribution. The school, sponsored by the University of West Virginia and the Public Service Commission of West Virginia, is the first of its kind in eastern United States, and the third in the country. H. J. Wagner of the Public Service Commission was chairman of the Meter School committee.

The dates set for this year's meeting are August 21, 22, and 23.

■ ■

New Butane Plant Erected By Northwest Cities Co.

A butane storage plant is being constructed at Lewiston, Idaho, by the Northwest Cities Gas Co., whose headquarters are at Walla Walla, Wash. The new plant will cost approximately $7000, and will serve butane to Clarkston, Wash., replacing the manufactured gas previously used, according to D. E. Wolf, Lewiston district manager.

The construction contract is held by Ransome Co., Emeryville, Calif.

■ ■

Colusa Gets Butane Standby

The Pacific Gas and Electric Co. is installing a butane-air standby plant at Colusa, Calif. The plant consists of a 6000-gal. storage tank and one 5000 cu. ft. per hour Gas-air vaporizer and mixer.

Installation is in charge of Harry J. Smith, chief engineer of gas construction, Pacific Gas and Electric Co.

Western Section of L.P.G.A. Holds Los Angeles Meeting

ABOUT 40 members of the Pacific Coast Section of the Liquefied Petroleum Gas Association met at the Hotel Mayfair in Los Angeles, April 25, Gilbert Woodill, chairman, presiding.

G. WOODILL

During the morning session papers were presented by W. T. Joplin, Butane, Inc., Phoenix, who reported the L. P. G. A. convention in Oklahoma City February 20 to 22; Turner C. Smith, General Petroleum Corp., discussed the revisions made in the National Fire Protection Association pamphlets pertaining to the handling and storage of liquefied petroleum gases; and Clarence Winther, Winther Brothers, Fresno, Calif., spoke on the profit motive in installation of liquefied petroleum plants.

After luncheon, the meeting resumed with an open discussion of various problems of the industry under the direction of Mr. Woodill.

Another meeting of the Pacific Coast Section was held in San Francisco April 27 covering practically the same subjects discussed at the Los Angeles meeting.

■ ■

Natural Gas Installed To Fire Santa Fe Locomotives

Natural gas equipment is being installed in the Santa Fe roundhouse in Brownwood, Texas, for the purpose of firing and heating locomotives. Gas will replace oil for firing the engines in the roundhouse, effecting an estimated saving of 50 per cent in the cost of getting steam in locomotives.

The Community Natural Gas Co., Dallas, has extended its lines to the roundhouse, and the interior installations are being made by the Santa Fe crew.

■ ■

Imperial Co. Erects Stations

The Imperial Gas Co., Los Angeles, Calif., has recently installed tank truck filling stations at Vista, Adelanto and Hemet, Calif., for the distribution of Rockgas. This gas which is a mixture of propane and isobutane, is designed for operation where temperatures fall considerably below freezing, and is sold for domestic use only.

■ ■

Hospital to Have Gas

Work is to begin immediately to extend natural gas from the city of Yankton, S. D., to the state hospital north of the city. The gas will replace coal in the operation of two steam boilers. Ellerman and McLain, local contractors, will construct the necessary pipe line from the city to the hospital, and expect to have the work completed by June 1.

■ ■

Natural Gas Dries Alfalfa

Natural gas supplied by The Gas Service Co., Kansas City, Mo., and the Cities Service Gas Co., Bartlesville, Okla., is being used by W. J. Small of Kansas City, Kan., for dehydrating alfalfa. Mr. Small owns the two largest units of this kind ever built for the purpose in Kansas City, Kan., and one in Belle Plaine, Kan.

The farmer's alfalfa crop is cut by machinery owned by Mr. Small, and then is hauled to the plant, where it is shredded and dehydrated by natural gas.

■ ■

Calif. Co. Handles Butane

J. S. West and Co. of Modesto, Calif., have recently entered the liquefied gas field, and are arranging delivery service for butane gas to customers in Stanislaus County. Modesto, Turlock and Oakdale are the main cities to be served. The butane will have a B.t.u. of 3200.

United Gas Pipe Line Co. Plans Louisiana Gas Line

The United Gas Pipe Line Co., a subsidiary of the United Gas Corp., Houston, Texas, has made plans for the construction of a pipe line from the Lirette field in Terrebonne Parish, La., to the west bank of the Mississippi River where the company has several large industrial consumers. Several right-of-way grants in Terrebonne Parish have been filed by the company, and surveying for the line has already been started.

The line will be the first major gas line in Terrebone and Lafourche parishes. The company is now negotiating for a franchise in Lafourche.

THE CONTINUOUS CHOICE OF HACKNEY CYLINDERS IS BASED ON PERFORMANCE

Year after year the gas industry demonstrates its preference for Hackney cylinders — a preference based on actual performance records and the satisfactory experience resulting from the use of Hackney cylinders for storage and transportation of Propane and Butane.

Complete understanding of the characteristics of gases, liquids and solids — ample equipment and the intimate knowledge of metals have produced a complete line of Hackney containers best suited for each service requirement. Uniform strength, capacity and weight provide maximum economy and assure complete satisfaction. Write today for detailed information about Hackney cylinders for Propane and Propane-Butane mixtures. There is no obligation.

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PRESSED STEEL TANK COMPANY

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666 Roosevelt Building, Los Angeles
1363 Vanderbilt Concourse, New York
1463 South 66th Street, Milwaukee

Containers for Gases, Liquids and Solids

Taking Gas to the Country

(Continued from Page 81)

gas appliances are not suitable for butane service any more than appliances for manufactured gas are suitable for use with natural gas. Much higher operating efficiencies are possible with butane as compared to natural or manufactured gases, in certain applications, especially so with top burner cooking. This fact brings the cost of certain heat applications with butane even closer to that of natural gas than a comparison of their respective rates at first appear when viewed strictly from an equivalent B.t.u. standpoint. The A.G.A. Laboratories at Cleveland are thoroughly familiar with the requirements for butane appliances and will soon be equipped to test and approve appliances of all kinds for butane service. In fact, the January, 1939, list of approved appliances shows that the Laboratories have tested and approved 10 different lines of ranges and nine different lines of water heaters for use with undiluted butane. A great many more have been approved for use with propane. This is a most important step toward insuring satisfaction to the customers on this infant gas service and towards insuring against service calls on the part of the company.

The cost on the part of the customer to install a butane tank under the merchandising type of business mentioned varies from about $125.00, for a tank of sufficient size to adequately take care of a range and possibly a water heater, to about $350.00 for a unit of sufficient size to take care of all fuel requirements, including heating in the home and in a climate where winters reach and remain for several days at about 15° F. or lower. These costs do not include any appliances but merely cover the cost of the tank and the yard line. The cost on the part of the customer to install service of the gas utility type is about the same as the cost for a natural gas customer to install gas in the city. In some cases, it is actually less due to the fact that the yard lines are shorter than are required for natural gas service where the mains lie in the street or alley; and due to the fact that the sizes of the pipe are smaller than those used on natural gas because butane gas has about three times the heating value of natural gas.

The price charged for the butane varies from 6½c per gal., delivered in the customer's tank, in territories where cut-throat competition exists, and which price definitely includes no profit, to 12c and in some instances 15c per gal. Ten gals. of butane are equivalent to Mc.f. of natural gas of 1000 B.t.u. heat value. Therefore, butane selling at 6½c per gal. would give the customer as much heat as 65c per Mc.f. of natural gas. At 12c a gal. the comparison would be $1.20 per M c.f. of natural gas.

In the gas utility type of business rates are constructed from a promotional angle and on a sliding scale, and approach that of natural gas rates remarkably close considering the short time such service has been provided. The average price per gallon paid by an individual customer is therefore dependent on the amount of use he has for the gas and the resultant consumption. The first step in conjunction with a minimum monthly bill is designed so as to insure every customer paying his pro rata cost of service. After this, the rate drops sharply. The rate now in effect on New Stargas Service, the name given to the rural gas service rendered by Lone Star Gas System, is as follows:

> *Minimum Monthly Bill:* $2.75 which entitles customer to 2 gals. per month, and 9c net per gal. for next 48 gals. per month, 8c net per gal. for all over 50 gals. per month.
>
> Two (2) cents per gal. is added if bills are not paid within 10 days from date of billing.

Expressed in terms of equivalent Mc.f. natural gas, the rate would be:

> *Minimum Monthly Bill:* $2.75 which entitles customer to 200 cu. ft. per month, and 90c net per Mc.f. for next 4.8 Mc.f. per month; 80c net per Mc.f. for all over 5 Mc.f. per month.

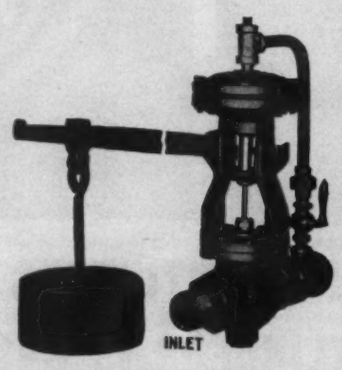
Expressed in terms of manufactured gas of 500 B.t.u. heating value, the rate would be:

> *Minimum Monthly Bill:* $2.75 which entitles customer to 400 cu. ft. per month, and 45c net per Mc.f. for next 9.6 Mc.f. per month; 40c net per Mc.f. for all over 10 Mc.f. per month.

Expressed in terms of electric energy, we have the following equivalent electric rate:

> *Minimum Monthly Bill:* $2.75 which entitles the customer to 60 kw. hr. per month, and 3 mills net per kw. hr. for the next 1440 kw. hr. per month; 2⅔ mills net per kw. hr. for all over 1500 kw. hr. per month.

For
OIL
and
GAS
under High Pressure



You can handle pressures up to two thousand pounds under perfect control and pass on to your distributing lines whatever reduced pressure may be called for by use of the proper C-F Regulators. There are standard regulators for all pressures up to 600 pounds—for higher pressures, designs are adapted to suit specifications.

The CHAPLIN-FULTON MFG. CO.
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Preview of coming campaigns by

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

GAS APPLIANCE SOCIETY OF NORTHERN CALIFORNIA

MAY
AUTOMATIC GAS WATER HEATER CAMPAIGN

This advertisement is a last reminder to dealers that an **automatic gas water heater campaign** is now in progress throughout P. G. & E. gas territory.

The principal feature is an increase in the normal trade-in allowance on old, non-automatic water heaters from $5 to $12 — the difference being paid by the manufacturers and the P. G. & E.

On top of that, the P. G. & E. is spending **more than $30,000** on promotional water heater advertising and is assisting dealers in their advertising.

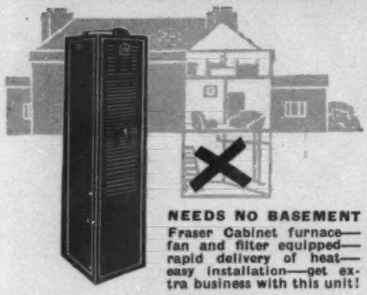
The campaign expires May 31. Don't let it pass by without turning it to your own profit.

G205-539

DEALERS: By watching this page from month to month you can keep informed of sales promotional campaigns to be sponsored by the Pacific Gas and Electric Company and the Gas Appliance Society. Detailed information will be supplied, as usual, through the mail. If such information is not received, call our local office or write Gas Appliance Society, 1355 Market Street, San Francisco, California.

Line up for profits in '39

FRASER
GAS HEATING EQUIPMENT



NEEDS NO BASEMENT
Fraser Cabinet furnace—fan and filter equipped—rapid delivery of heat—easy installation—get extra business with this unit!

ALSO—
- TUCK-A-WAY FURNACES
- BASEMENT FURNACES
- FLOOR AND WALL FURNACES
- CIRCULATING HEATERS
- FURNACE FANS AND FILTERS

IT PAYS YOU TO SELL AND INSTALL THIS SUPERIOR EQUIPMENT

MANUFACTURED BY
FRASER FURNACE CO.
STOCKTON, CALIFORNIA

DISTRIBUTORS
H. R. BASFORD COMPANY
425 Second St. San Francisco
911 S. Grand Ave. Los Angeles

Here's Double Protection Against Pipe Corrosion

End pitting on your distribution lines with No-Ox-Id and No-Ox-Idized Wrappers. No-Ox-Id combinations act: (1) mechanically, to protect the pipe against destructive action from outside and (2) chemically, to inhibit corrosion under the film.
You can recondition your pipe lines at lower cost with No-Ox-Id. Available in all consistencies for hot or cold application—by machine or by hand. Write today.

DEARBORN CHEMICAL COMPANY
310 South Michigan Ave., Chicago, Ill.

NO-OX-ID
IRON RUST
The Original Rust Preventive

Los Angeles
807 Mateo St.
TRinity 3385

San Francisco
421 Bryant St.
SUtter 8688

In viewing this rate for New Stargas Service as compared to natural and manufactured gases and to electricity, it must be kept in mind that the service these rural customers receive is in no manner or detail inferior to that received by customers on any natural or manufactured gas system. The Company invests in and maintains all equipment necessary to provide continuous service to each customer's yard line—the same as it does in pipe line service. The responsibility for maintaining an ample supply of fuel for each customer's instant use rests solely on the company—the same as in pipe line service. All leakage up to the point where company equipment is attached to customer's yard line is borne by company—the same as in pipe line service. Bills for service are rendered monthly for the amount of fuel that has been used—the same as in pipe line service. Service may be discontinued by customer whenever he wishes—the same as on pipe line service.

The cost to install the service and the cost of the appliances to use the service are the same as for natural gas. The monthly cost is only a little higher than for most natural gas services and definitely cheaper than any other comparable fuel services.

The prevailing price for butane in tank car quantities is 3½c and lower as the requirements increase, F.O.B. shipper's cars at the gasoline plants. The tank cars are customarily owned by the producers of butane.

At the present time, service is rendered in six districts on Lone Star Gas System: Dallas, Fort Worth, Waco, Temple, Taylor and Georgetown. This service is provided to customers within an approximate radius of 25 miles of each of these district points. Service was started in the Dallas area in the summer of 1935; in the Fort Worth area the summer of 1936; in the Waco area the summer of 1937; and in Taylor, Temple and Georgetown in November, 1937. We have found that the investment runs about $175.00 per customer at the present time. As more customers are added around the bulk stations in these districts, the pro rata investment will be reduced some. Gross revenue per customer amounts to about $67.00 per year at this time, and with present customers not yet fully equipped with all the appliances they need. We find that it takes about 250 customers in each district to make the venture profitable—considered strictly from the distributor's angle. It so happens that we have natural gasoline plants that furnish our own butane; however, no producer's profit is included in the above statement.

In the cautious and careful manner in which promotion work has been carried on to date, we find that we attach in each district from 125 to 175 customers per year, so that it may be safely predicted that an individual district should be on a profitable basis within two years' time.

Locating the Market

An analysis of the 1930 census was made covering the counties in Texas, alone, in which Lone Star Gas System had distribution organization and disclosed, after all Negro and Mexican population was eliminated, that 170,000 white families were without gas service. This was then broken down as to the number of rural families into farmers and those who were non-farmers, suburbanites or living in small towns. The farm families were broken down further into those who owned the farm and operated it and those who were tenants. Of the farm families who own their farms, we assumed that we would ultimately attach 20 per cent, or one out of five families; of the tenant farmer, five per cent, or one out of 20 families, and of the non-farm families, 20 per cent, or one out of five—thus, arriving at a rather conservative potential market for each county. Those counties then that showed a potential of less than 250 customers were eliminated. Also, those counties having considerable gas production with many lines laid across the county were eliminated. The remaining counties, showing a potential of 250 or more customers, totaled 20,000 potential rural customers adjoining Lone Star System.

I presume that corresponding figures are available from the Department of Commerce on every state and county in the Union, and they may disclose an interesting picture on your own territory.

It appears that the existing organizations and facilities of the present gas companies definitely place them in a most advantageous position to expand their services and secure for themselves additional revenues from this rural market. If the gas industry does not take advantage of this temporarily strategic position it has with respect to this market, the market is going to be served by someone else. Gas men are familiar with the local butane gas companies, which are doing a creditable job in spite of inexperience and in many cases lack of capital.

Are we, as operating gas companies, overlooking a new source of revenue when the rural gasification activities in our respective territories are being carried on by someone else?

Program for A.G.A. Meeting Of Executives Announced

THE Executive Conference of the American Gas Association will be welcomed to San Francisco, May 15 by James B. Black, president, Pacific Gas and Electric Co. Sessions will be held at the Fairmont Hotel, May 15 and 16.

The program of the two-day meeting has been announced by H. L. Farrar, president, Pacific Coast Gas Association, and chairman of the Conference program committee. The first session will be called to order by Conrad N. Lauer, president, A.G.A. Other featured speakers will include William Alton Jones, executive vice-president, Cities Service Co., New York City; C. E. Bennett, president, Manufacturers Light and Heat Co., Pittsburgh; Frank C. Smith, president, Houston (Texas) Natural Gas Co.; W. C. Beckjord, vice-president and general manager, Columbia Gas and Electric Corp., Wilmington, Del.; Herman Russell, president, Rochester (N. Y.) Gas and Electric Corp.

George S. Hawley, president, Bridgeport (Conn.) Gas Light Co., has worked with Mr. Farrar preparing the program.

■ ■

Today's Economic Principles Discussed in New Book

Economic principles essential to employment expansion in the United States, and basic conflicts between a spending policy and a program of saving and investment in productive enterprise, are discussed in a book recently published by the Machinery and Allied Products Institute, Chicago, Ill., under the title, *Capital Goods and the American Enterprise System.*

The institute states that the outstanding phenomenon of this decade of depression is the stoppage of the flow of saving and credit into business enterprise in the United States. Several pages are devoted to discussion of the over-saving and under-consumption theory, and legislation related to the policy of spending and discouragement of saving is analyzed in detail.

■ ■

Kerotest Issues Catalog On Refrigeration Equipment

Catalog No. 9, *Refrigeration and Air Conditioning Valves, Fittings and Accessories,* has been issued by the Kerotest Manufacturing Co., 2525 Liberty Avenue, Pittsburgh, Pennsylvania. The catalog consists of 32 pages of cut-a-way photographs and descriptions of Kerotest valves, fittings and accessories for refrigeration and air conditioning units. Complete information on size, weight, catalog number, code and list price is given in tabulated form for each item.

■ ■

Sprague Bulletin Covers New Meter-Regulator

The Sprague Meter Co., manufacturers of cast iron gas meters, have issued a No. 21 bulletin covering the combination meter and regulator which has been recently introduced to the trade. This bulletin contains illustrations of the unit, together with performance curves and description.

Copy of this bulletin may be obtained by addressing the company at Bridgeport, Conn.

You are invited to be guests of

THE WEBSTER ENGINEERING CO.

May 8-11

A. G. A.

Natural Gas Convention

TULSA

We will extend every effort to make your attendance at the Convention both informative and pleasurable. Be sure to drop in at our downtown headquarters in the Mayo Hotel, and plan to make a trip through our manufacturing plant located at 419 West Second Street.

The WEBSTER ENGINEERING CO.

Tulsa, Oklahoma

Division of

SURFACE COMBUSTION CORP., TOLEDO, OHIO

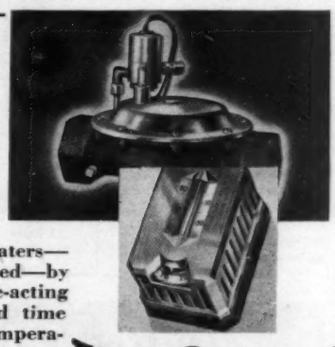
F. J. Evans Engineering Co., Birmingham

Gas & Heating Specialty Co., Dallas Mechanical Equipment Co., Houston

COMPLETE

Electrically-Operated

GAS CONTROL SETS



Klixon gas valves—suitable for all types of heaters—and solenoid troubles. Being thermally operated—by the Spencer snap-acting disc — these positive-acting valves don't hum or stick. Moreover, calibrated time delays eliminate flutter, chatter and ambient temperature troubles.

Sizes from ⅜" to 1¼" I.P.S. through 1000 cu. ft. Low or 110 volts. Sold separately or in packaged sets with Klixon Room Thermostat. Write—

KLIXON

Spencer Thermostat Company . . . . . Attleboro, Mass.

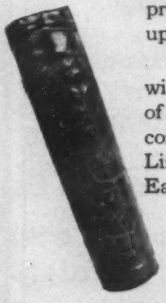
FOR EFFECTIVE PIPE PROTECTION

COATINGS must be WRAPPED with ASBESTOS FELTS

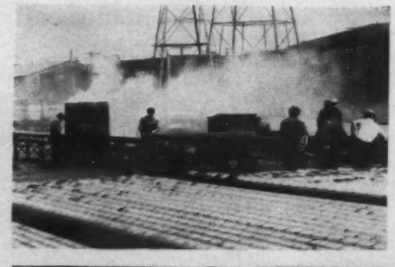
● More than 25 years' experience in the oil and gas industries has proved many types of ferrous pipes must be protected by a corrosion-resistant coating. What's more, the coating must be reinforced or shielded with a strong, durable wrapping to prevent distortion and abrasion. And, for that service, asbestos—in the form of J-M Pipe-Line Felts—has proved the ideal material.

Because the asbestos fibers are inorganic and non-tubular, J-M Asbestos Felt cannot support capillary action. Tough and durable, it reinforces the coating against earth load and soil stress. And, because it is exceptionally resistant to the corrosive action of soil acids and alkalis, this durable felt gives efficient protection for the coating . . . helps keep upkeep costs to a minimum.

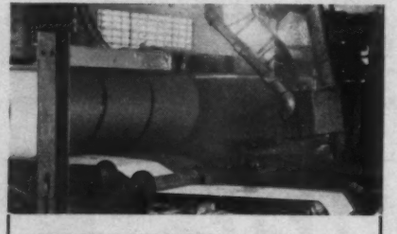
You'll be interested in the whole story. It will show you why more than 30,000 miles of pipe are operating at low cost under severe conditions. Write for the J-M Asbestos Pipe-Line Felt brochure to Johns-Manville, 22 East 40th Street, New York, N. Y.



UNWRAPPED BITUMINOUS COATING after exposure to clay-content soil. Soil stress has destroyed much of the protective coating.



THE SAME COATING, under the same conditions, but wrapped with J-M Asbestos Felt. The wrapping shows no signs of breakdown . . . the coating underneath is practically as good as new.



YOU CAN PURCHASE pipe from the steel-pipe mill coated with any standard coating material and wrapped with Johns-Manville Asbestos Felts. Or the same operation can be performed in your own yard by portable wrapping equipment supplied on a rental basis. Write Johns-Manville, 22 East 40th Street, New York, N. Y., for further information.

JOHNS-MANVILLE JM

ASBESTOS PIPE-LINE FELTS

New York-New Jersey Regional Sales Conference To Meet June 1-2

THE 1939 Regional Sales Conference, sponsored by the Commercial Section for the states of New York and New Jersey will be held at the Hotel New Yorker, New York City, on Thursday and Friday, June 1 and 2. Evenings are open for attendance at World's Fair. J. P. Leinroth, Public Service Electric and Gas Co., Newark, N. J., is chairman of the council in charge.

Among the topics to be covered at the morning and afternoon sessions on these days are: Trends in Residential Consumption and Their Significance; Gas at the 1939 New York World's Fair; Symposium on Housing; Water Heating; Training Salesmen; The Swing to Gas Refrigeration; Home Heating; Meeting Competition with CP Ranges; and a Home Service playlet.

Among those invited to address the conference are: C. E. Paige, president, Brooklyn Union Gas Co.; John B. Reid, co-chairman, A.G.A. Committee on Market and Economic Research; Hugh Cuthrell, president, Gas Exhibits, Inc.; editors of *Architectural Forum* and *American Builder*; representative of the Federal Housing Administration; several builders utilizing gas for the four big jobs in their home developments; R. A. Lawder, Consolidated Edison Company of New York, Inc.; B. A. Seiple, Jersey Central Power and Light Co.; Harold F. Coleman, The Brooklyn Union Gas Co.; H. S. Christman, The Philadelphia Gas Works Co.; H. G. Schaul, Westchester Lighting Co.; and O. F. Flumerfelt, vice-president, Iroquois Gas Corp.

■ ■

California WPA Camp Installs Gas for Cooking and Water Heating

Gas cooking and water heating equipment was recently installed in Camp Chino, the most recent of California's 40 WPA camps, which are strung from the Oregon border to San Diego. This camp, situated on Southern Counties Gas Co.'s lines, just out of the town of Chino, has been erected to house the 1500 WPA workers whom the federal government is furnishing to construct the new state prison in southern California.

In the kitchen, which will eventually supply three meals a day for this number of men, there is installed a heavy duty Madsen gas range for roasting, boiling and frying, a three-deck Montague bake oven for bread, cakes, pies and pastries, and various types of steam pressure cooking equipment. Steam is supplied by two 30 hp. Kerrick-Kinetic flash boilers, which also heat the hot water used in the camp.

■ ■

P. G. and E. Continues Extension of Lines from Calif. Fields

Gas from the Trico gas fields in the northern part of Kern County will be available in both San Francisco and Los Angeles when the Pacific Gas and Electric Co. completes an 8-in., 14-mile gas pipe line from the Trico field to its main line in the Lost Hills area.

The company is considering the construction of three sections of pipe line north and west from Sacramento to tie together the gas supply from the Kettleman Hills, Rio Vista and Sutter Buttes areas.

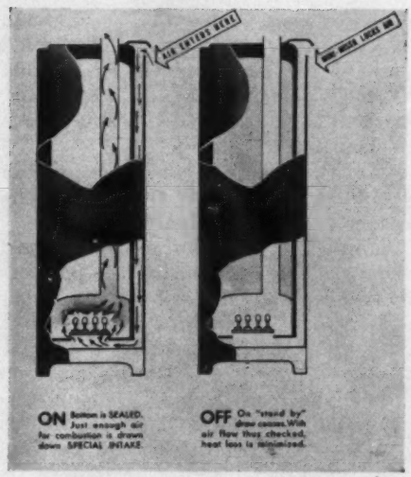
The 36-mile line being constructed by P. G. and E. from Marysville to Lincoln has been partially completed with the crossing of the Yuba River. The line to Lincoln is estimated to cost $255,000.

The company has been granted a 50-year franchise to serve natural gas throughout Sutter County, by the board of supervisors. Under the franchise the county will receive two per cent of the gross revenue for gas served.

■ ■

Plan Proposed for the Proration of West Panhandle Field Gas

Proration of the sweet gas area of the West Panhandle field was proposed by the Canadian River Gas Co., Amarillo, Texas, at a hearing of the Railroad Commission. The plan provides for the division of the field into two zones, the south portion not needing proration due to the absence of drainage and elements of waste, and the north zone, which is owned for the most part by Canadian River Gas Co. and Panhandle Eastern Pipe Line Co., Kansas City, Mo., being prorated on the basis of one-third of the potential and two-thirds of the acreage times rock pressure.


AIR ENTERS HERE
ON Bottom is SEALED. Just enough air for combustion is drawn down SPECIAL INTAKE.
OFF On "stand by" draw ceases. With air flow thus checked, heat loss is minimized.

Crane Water Heater

Crane Co., 836 South Michigan Ave., Chicago, Ill.

Model: Crane Superior with Mini-Miser.

Selling Features: A new principle of air control, for which a patent has been applied, is known as the Mini-Miser because, according to Jim Donnelly, sales manager, Premier Heater Division, La Porte, Ind., it minimizes heat loss and is a miser on gas cost. The Mini-Miser regulates air flow, giving the heater just enough air for combustion when the burner is on, and checks air flow when the burner is off. Intake of air needed for combustion is at the top of the heater instead of at the bottom. When the burner is off, which is approximately ¾ of the time, an air lock is created. Cold air is locked out and heat loss is minimized. The entire base of the heater is closed.

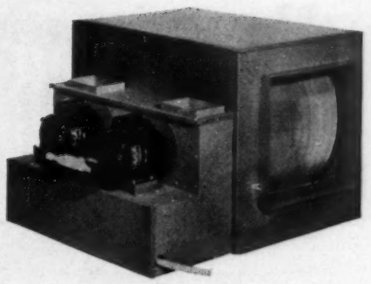
Other new features introduced in the Crane Superior with Mini-Miser are: a 5-in-1 thermostat which includes gas filter; built-in gas flow adjustment; main shut-off valve; safety push-button control (main burner cannot be turned on until the pilot is lighted); a new electro-magnetic gas shut-off, which shuts off the gas supply if the pilot should be extinguished; an insulated, plug-type combustion chamber door that protects the exterior finish against discoloration; 2-½ in. of Heatseal insulation is in this unit. If desired, the Geyser principle of heating can also be had in the 1939 Superior with Mini-Miser.

■ ■

Cribben & Sexton Publish Creative Selling Catalog

The creative selling catalog on Universal gas ranges, recently published by Cribben & Sexton Co., Chicago, has been designed so that salesmen can present the story of the modern gas range to prospects point by point by means of headlines, copy and illustrations.

The book takes into account the fact that most women have accepted gas ranges without realizing their many points of excellence. It also seeks to create in the minds of women the subconscious acceptance that there must really be something to this new gas range.



Dehumidifier

The Bryant Heater Co., 17825 St. Clair Ave., Cleveland, Ohio.

Model: Silica Gel Dehumidifier.

Selling Features: Applying the principle of resaturation cooling, this new unit dehumidifies and cools air. The silica gel adsorbent material is carried in a cylindrical basket that turns continuously. Both the conditioned air and heated air streams are continuous and simultaneous in flow. Dividing seals inside the cylinder separate these two air streams. In a recent demonstration in a large closed room with 50 people present, the new unit reduced moisture from 135 to 50 grains per lb., and the temperature from 95° to 72° F. in less than 20 minutes.

■ ■

Gas Service Employe Dies

William A. Farrell, 60, superintendent of The Gas Service Co. at Webb City, Mo., died suddenly March 22. Mr. Farrell had been superintendent since 1928.

PROTECTS GAS USERS

"CALODORANT" gives a swift warning against leak danger

CALODORANT will remain completely vaporized during long periods of transmission and the odorizing power remains unimpaired.

CALODORANT gas odorizing agent has a distinctive and penetrating odor that is generally associated with manufactured gas. For over eight years leading gas companies have found it to be a vigilant detector of dangerous and costly leaks. Immediately upon the addition of CALODORANT to gas it gives warning of leaks in distributing systems and household appliances—a warning that may prevent loss of life and property. It adds no odor to burning gas. It is non-corrosive—non-injurious to equipment or users.

CALODORANT

REG. U. S. PAT. OFF.

GAS ODORIZING AGENT

AVAILABLE IN TANK CARS AND IRON BARRELS

Address Inquiries to

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco, Calif. **30 Rockefeller Plaza, New York, N. Y.**

New Jersey Association Holds 28th Convention

THE 28th Annual Convention of the New Jersey Gas Association was held at the Berkeley Carteret Hotel, Asbury Park, New Jersey, on April 12, 1939. Between 700 and 800 members and guests were present. B. A. Seiple, president of the Association reported to the convention on the accomplishments for the past year stressing the value of the regional meetings and the cooperative gas exhibits sponsored by the Association. Mr. Seiple also presented to the convention abstracts from the various committee chairmen reports.

Major Alexander Forward then brought a message from the American Gas Association. Major Forward introduced Conrad N. Lauer, president of the American Gas Association, who addressed the meeting.

Billy Van, Mayor of Newport, N. H., a member of the New England Council and noted lecturer and humorist, unfolded in an interesting and instructive manner the work which has been done to carry business on in the traditional manner in New England. The theme of his speech was "Yankee Adaptability."

McCarter Medals and National Safety Council President's Medals were awarded by H. W. Nicholson, Public Service Electric and Gas Co., as follows:

McCarter Awards: (Bar) William Grunewalder; (Medals) Waldo Simonson and John Frank Rodmaker; (Certificate of Assistance) Henry Jensen.

President's Medal of the National Safety Council was awarded to James McGrath and Thomas Chamberlain.

At the opening of the afternoon session the Home Service Committee under the direction of Mrs. Mary N. Hall, chairman, brought into the meeting room two meals, one of which was placed in the oven of a CP range and the other on a top burner. The range was installed on the stage. The burners were lighted and the thermostat set on the oven, then a big chain was put around the range and locked, the meals being left to cook while the rest of the afternoon program went along.

J. P. Leinroth outlined the gas industries' part in the World's Fair and asked the gas industry to make good use of the gas exhibits. Miss Hilda Torrop, personal adequacy consultant, talked about the individual person's balance sheet.

L. N. Quad presented a paper on profiting by customer complaints. The paper advocated an analysis of all complaints by type with a view toward equipping and preparing the business office representatives for the proper handling of complaints in advance of the actual customer contact.

R. S. Agee of A.G.A.E.M., spoke on the advantages of the CP range to the gas industry. At the conclusion of Mr. Agee's talk the chain was removed from the range and the two meals were removed and put on display.

The following officers for the 1939-40 association year were elected:

President: George B. Webber, Public Service Electric & Gas Co.

First Vice President: Frank H. Darlington, Peoples Gas Co.

Second Vice President: Preston D. Gardner, Public Service Electric & Gas Co.

Secretary-Treasurer: Harry A. Sutton, Public Service Electric & Gas Co.

Directors for three years: L. N. Yetter, Atlantic City Gas Co.; L. W. Becker, Elizabethtown Consolidated Gas Co.; E. J. Menerey, Peoples Gas Co.; John A. Clark, Public Service Electric & Gas Co.

Director for two years to fill vacancy: Howard H. Melvin, Cumberland County Gas Co.

In the evening a banquet and entertainment was held at which time a gift was presented to B. A. Seiple, retiring president.

The CP range was given away as a prize to the holder of the lucky ticket, being won by Jacob Loos, Public Service Electric & Gas Co., West N. Y.

■ ■

Canadian Group To Meet

The Sixteenth Annual Convention of the Natural Gas and Petroleum Association of Canada will be held at the General Brock Hotel, Niagara Falls, Ontario, Canada, on Thursday and Friday, June 1 and 2, 1939.

The morning and afternoon sessions on Friday, June 2, will be devoted entirely to papers, discussions and a questionnaire on practical problems of the natural gas industry.

Major E. Sweet, Brantford, Ontario, is president of the association.

■ ■

S.G.E. Names Representative

Appointment of Albert Rapfogel, manufacturers' representative with offices and showrooms at 700 Prospect Ave., Cleveland, as midwest territorial representative of the Standard Gas Equipment Corp., New York City, has been announced by H. C. Erhard, general sales manager.

■ ■

Aubuchon Joins Laclede

Cliff W. Aubuchon, for many years sales promotion and advertising manager of the St. Louis *Star-Times*, has been made counselor in sales promotion, advertising and selor in sales promotion and advertising of the Laclede Gas Light Co., St. Louis, Mo.

THE CONDENSATION ELIMINATOR
is used where space is limited. It eliminates Condensation and with its Draft Construction prevents costly preheated air from escaping out of the chimney. That means warmer basements—5°-7° F. and produces a big saving in fuel. Don't forget! —the Condensation Eliminator helps you save money.
Condensation Engineering Corporation
335 South Western Avenue, Chicago

GAS—810 South Spring Street, Los Angeles, California

Yes! SEND ME GAS

for ☐ 3 Years at $2.00 ☐ 1 Year at $1.00,

SUBSCRIPTION RATES: United States, Canada, Mexico and Central American countries (in advance), three years $2.00; all other countries, $3.00 per year.

Name.....Position.....

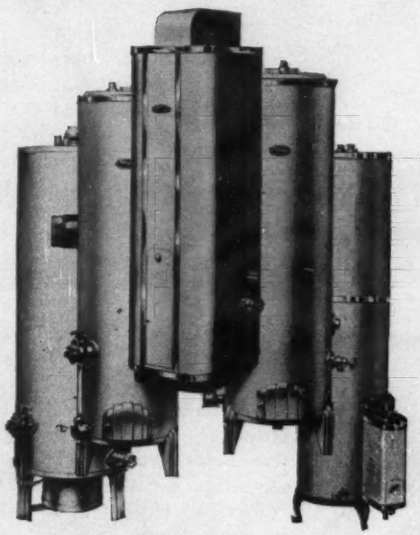
Company.....

Address.....

City.....State.....

☐ Check enclosed ☐ Send bill

STEPPING STONES
To Greater Gas Sales



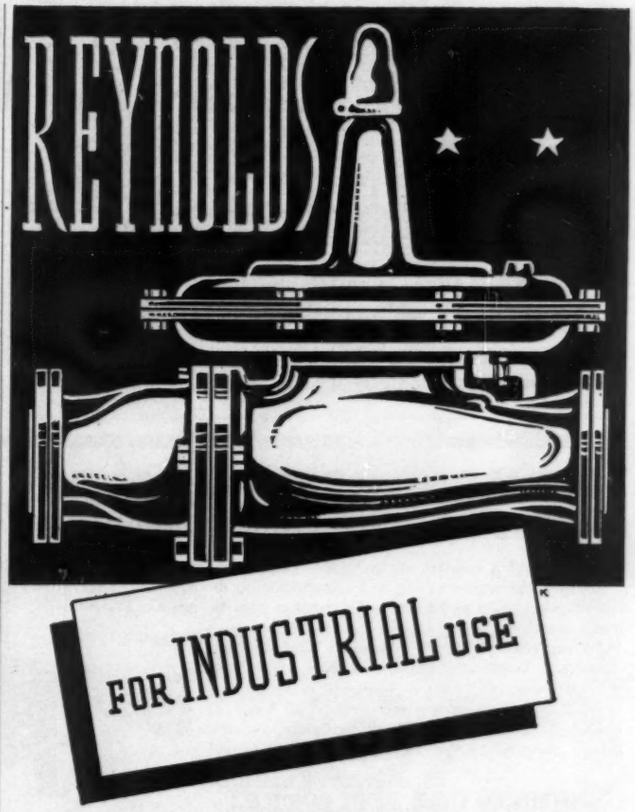
THE WELSBACH LINE OF
HOTZONE
Welsbach
GAS WATER HEATERS

In the HOTZONE *Line Your Salesmen Have:*

- Super-Automatic delivery of unlimited hot water for homes with the nation's finest living standards.
- Self-acting hot water storage for the great average class.
- Gas bill control plus automatic hot water for those who must pinch pennies.
- And a sales drive campaign that actually moves heaters into homes — including sales strategy, merchandising plans, advertising helps.

Welsbach COMPANY
Gloucester City, N. J.

BRANCHES IN CHICAGO AND SAN FRANCISCO



REYNOLDS Toggle Type Regulators for industrial Gas Control offer these features:

Removable valve pocket and orifices—side hand holes—streamlining that does not change direction of the flow of gas, increasing capacity and range—pressure reduction from pounds to pounds and pounds to inches W. C.—single or double valve construction—spring or dead weight type adjustment and equipped with or without pilot control.

Regardless of how unusual or difficult the requirement, there is a REYNOLDS Engineer ready to give you the correct answer. Write.

☆

BRANCH OFFICES:
421 Dwight Building, Kansas City, Mo.
2nd Unit, Santa Fe Building, Dallas, Texas.

REPRESENTATIVES:
Eastern Appliance Company, Boston, Mass.
Wm. A. Ehlers, 49 S. Clinton Street, East Orange, N. J.

R

REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana, U. S. A.

GAS CONTROL SINCE 1892

Coast Counties Gas Co. Shifts Men; Promotes A. R. Bailey; K. B. Anderson

H. L. FARRAR, president of the Coast Counties Gas and Electric Co., Santa Cruz, Calif., has announced the appointment of A. R. Bailey as assistant to the president, a newly created position, with headquarters in San Francisco. K. B. Anderson, manager of the Coast Industrial Gas Co. and Coast Natural Gas Co., has been appointed superintendent of the gas department of Coast Counties, replacing Mr. Bailey.

Mr. Bailey has been with the Coast Counties Gas and Electric Co. since June of 1930, and has been superintendent of the gas department for the entire territory served, since 1936. He was previously employed by the Los Angeles Gas and Electric Corp. and by the Pacific Gas and Electric Co.

Mr. Anderson has been manager of the Coast Industrial and Coast Natural Gas Companies for the past several years. Previously he was industrial gas engineer for the Coast Counties Gas and Electric Co. for the period 1929-1930, coming to this post from the Southern California Gas Co. Prior to that time he was employed by the California Petroleum Corp.

Other recent personnel changes within the Coast Counties Gas and Electric Co. have been the transfer of G. A. Carrothers, district manager at Taft, to the position of district manager for Hollister, the transfer of Fred Hix, local representative at Los Banos to the position of district manager at Taft, and the appointment of W. R. Snyder as local representative at Los Banos.

The Hollister-Gilroy Districts of the company have been operated as one unit for the past several years, under the direction of T. H. Underwood. However, increased business in both territories at the present time made it advisable for the return of Mr. Carrothers to Hollister, as full time district manager.

Mr. Hix has been local representative of the company at Los Banos since 1934, previous to that time being with the operating department in Contra Costa County. Mr. Snyder was formerly connected with the Sales Department in Hollister, and has also had experience with the operating department of the company.

All of these changes became effective April 1.

■ ■

American Meter Co. Prints New Tinned Meter Catalog

Catalog TG-4 of the American Meter Co., New York City, illustrated with photographs and devoting considerable space to new developments in tinned meter design and construction, shows in detail the actual evolution of these types of meters. Emphasis is placed on the most up-to-date types and devices with instructions on their practical applications and economics.

Catalog TG-4 also includes a supplement in which is reprinted material on domestic and industrial ironcase meters, meters for liquefied petroleum gases and data on Reliance regulators.

■ ■

Orifice Meters Described In Pittsburgh Equitable Bulletin

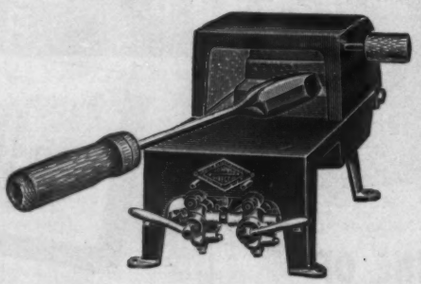
The Pittsburgh Equitable Meter Co. has recently issued Bulletin No. 1050 describing the EMCO Type 38 orifice meter. The construction, function and application of the EMCO orifice meter are fully explained in this 20-page booklet, which also contains many photographs and line drawings illustrating orifice meter measurement.

Copies of Bulletin No. 1050 may be obtained from Pittsburgh Equitable Meter Co., 400 North Lexington Ave., Pittsburgh, Pa.

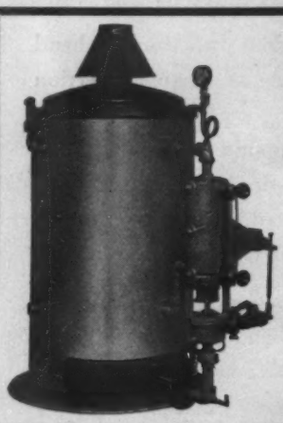
JOHNSON NO. 101 BENCH FURNACE

Saves Money on Many Jobs!

HEAT soldering coppers up to 12 lbs. per pair — do efficient heat-treating and case-hardening of carbon steel tools and small parts, such as chisels, dies, gears, etc. — at any desired temperature — including heat of high intensity. Two patented JOHNSON Direct Jet Bunsen Burners, each with shut-off valve and pilot — eliminate need for air-blast or blower. Amazing economy on all kinds of gas. Full refractory firebox lining adds to efficiency. Send for low prices and free catalog today!



JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA



INDUSTRIAL GAS BOILERS

Plain tubular . . . . . ¾ to 10 H.P.
Water Leg tubular . . 5 to 45 H.P.
HE Flueless . . . . . 1 to 18 H.P.

ASME Code for 100 lbs. S.W.P., also for higher pressures. Non-electric Low Water Cut-offs for all types of boilers.

P. M. Lattner Mfg. Company
CEDAR RAPIDS IOWA

BASO

THERMO ELECTRIC SAFETY CONTROL FOR GAS BURNING APPLIANCES

BOILERS ★ FURNACES ★ CONV. BURNERS ★ SPACE HEATERS ★ UNIT HEATERS ★ AIR CONDITIONERS OVENS ★ RANGES ★ WATER HEATERS, ETC.

GAS VALVE SERIES 500

MILWAUKEE GAS SPECIALTY CO.
MILWAUKEE ★ WISCONSIN

ELECTRIC SWITCH SERIES 600

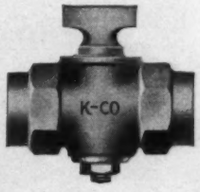
Take No Chances!

ALWAYS SAY "K-CO"
FOR HIGH-GRADE BRASS STOPS

K-CO

is the trade mark found on all Gas Stops made by Kitson. By it you identify products GUARANTEED for ease of operation and freedom from leakage . . . by always specifying "K-CO" you assure perfect performance.

G-501. Flathead Iron Body Gas Stop



G-503R. Tee Head Iron Body Brass Plug High Pressure Gas Stop with Recessed Threads.

K-700. Meter Connection with Cast Iron Bar and Built-in Iron Body, Lockwing Stop Cock and Brass Plug.

PRODUCTS OF KITSON COMPANY

2409-15 WESTMORELAND STREET ■ PHILADELPHIA, PA.

Manufacturers of KITSON SAFETY DEVICES (Lovekin Patents) for Domestic Water Heaters . . . Quality Brass Goods for Gas, Water and All Plumbing Uses.

The *Key* to A BIGGER GAS LOAD

★ There is no substitute for customer satisfaction . . . and customer satisfaction of **gas for fuel** depends upon the heating appliance used.

★

For 26 continuous years Pacific has made gas heating appliances for every need . . . establishing a reputation in the field for low service cost.

★

Then, too, there's the famous Pacific Multi-Tubular Burner and the completely welded, leak-proof heating element. These fine quality features, along with the dependability of Pacific Gas Furnaces, give users of gas **genuine home comfort** and keep them sold on **gas heat** as the ideal fuel.

Pacific
GAS HEATING AND VENTILATING FURNACE
Model A69

Pacific **GAS RADIATOR CO.**
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YOUR GRAPHS

on building

water-heating load

ARE READY

●

Please don't ask for them if you are already averaging more than 2% saturation per year.

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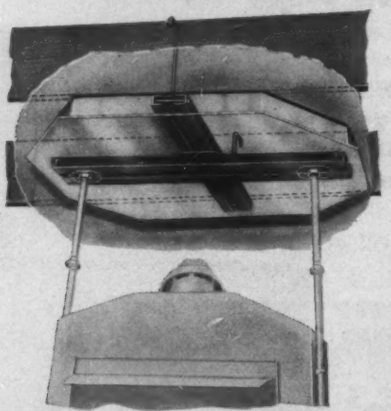
AUTOGAS CORPORATION

2258 Diversey Ave.

Chicago, Illinois

CUTS VIBRATION NOISE and INSTALLATION COSTS



INLAND UNIT HEATER HANGER AND CANOPY

Most practical device for suspending gas unit heater from ceiling or roof joists. Live rubber cushions absorb vibration. Insure quiet. Heater may be rotated to any angle on a horizontal plane. Time and labor savings alone pay for hanger. Insures more satisfactory service from unit heaters, and a neater installation. For finished ceilings aluminized steel canopy fully conceals hanger. Write for illustrated folder.

INLAND GAS SPECIALTIES

INLAND MANUFACTURING COMPANY

1120 North Cicero Avenue Chicago, Illinois

Gas Hydrate Formations

(Continued from Page 34)

absorption of the alcohol vapors in the Dehydrite:

Absolute Pressure Lbs. per sq. in.	Rate through meter, cu. ft. per hr. at 14.65 lbs. and 60° F
300	12.8
400	17.0
500	21.3
600	25.5
700	29.8

After a sufficient volume of gas has passed through the apparatus, the inlet valve is closed and outlet valve (15) is adjusted so that the pressure is slowly relieved from the apparatus. The glass tube is then removed, and the contents of the tube are transferred to a 300 ml. wide mouth flask which contains 25 ml. of approximately two normal chromic acid and 10 ml. of water. The flask containing the chromic acid solution should be immersed in an ice water bath before the Dehydrite is added, and the Dehydrite should be added a small amount at a time, dissolving each portion before adding another, in order to prevent overheating. If the Dehydrite sticks in the glass tube it may be loosened by inserting a piece of wire. Any Dehydrite that remains on the wire or in the tube is washed into the chromic acid solution with 20 ml. of water. The mixture is allowed to stand at room temperature for about 15 minutes, heated on a hot water bath for 30 minutes (or allowed to stand overnight at room temperature) cooled under the water tap, transferred to a 500 ml. volumetric flask, and the volume made up to 500 ml. with water. To 25 ml. samples of this diluted mixture, add about 3 ml. of 40 per cent aqueous potassium iodide solution and titrate the liberated iodine with one-tenth normal sodium thiosulfate solution, using starch as an indicator of the end point. A blank test is run at the same time in order to determine the exact concentration of the chromic acid solution.

Calculation:

$$X = \frac{235\ (A\text{-}B)\ C}{D}$$

Where

X = Lbs. Methanol per million cu. ft. of gas.

A = ml. sodium thiosulfate required in the blank determination.

B = ml. sodium thiosulfate required in the sample.

C = Normality of sodium thiosulfate solution.

D = Cu. ft. of gas that was metered through the Dehydrite tube.

To prepare a liter of approximately two normal chromic acid, dissolve 74 grams of C.P. Chromium trioxide (CrO_3) in 688 ml. distilled water. (If any insoluble matter remains, filter through asbestos.) Add carefully, 412 ml. conc. sulfuric acid.

Caution: [4,5]Do not use cotton plugs in the tube which contains the magnesium perchlorate. Do not use this method with gases that may contain mineral acids, and do not mix mineral acids with the Dehydrite unless there is more than 30 per cent water present. Avoid overheating; always add the Dehydrite to the diluted chromic acid solution, never in the reverse order.

Acknowledgment

Grateful acknowledgment is made to the West Texas Gas Co. and the Cities Service Gas Co. for their cooperation, which permitted the observation of practical operating data in portions of their pipe line systems.

I also wish to acknowledge the very helpful assistance rendered by my coworker, R. F. Provine, in the performance of the many experiments involved in the collection of these data. Without his conscientious cooperation this work would have been much more difficult.

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■ ■

United Fuel Co. to Build Purification Plant in W. Va.

The United Fuel Gas Co. of Charleston, W. Va., has entered into an agreement with the Girdler Corp., Louisville, Ky., for the erection of a gas purification plant in Kanawha County, W. Va. The plant will have a capacity of 15 million ft. of gas per day, and will remove hydrogen sulphide from sour natural gas. After the gas has been purified it will be distributed for domestic and industrial use.

J. F. Pritchard and Co. of Kansas City, Mo., are to build the plant, which is expected to be completed by early summer.

■ ■

Ford Joins United Gas Co.

Walter N. Ford, formerly vice president and general manager of the Memphis (Tenn.) Power and Light Co., has been appointed manager of industrial development for the United Gas Pipe Line Co., Houston, Texas.

Don't Dig Up Lawns or Pavements!

INSTALL PIPE WITH A GREENLEE Hydraulic PIPE PUSHER

It's Faster — Easier — Cheaper

Efficiency in the installation of pipe under lawns, streets, railroads, etc., comes from quickly pushing the pipe in place with the least possible trenching. Not only does it prevent damage, but it avoids interference with traffic and saves considerable time and money on the job.

The Greenlee Hydraulic Pusher requires a trench just long enough for the pushing operation; and one man, standing in a comfortable position can send the pipe where wanted, simply by pumping the handles. It is readily portable, easy to set up and simple to operate.

This tool is saving money for a list of users that grows larger each week. It can do that for you, too. Let us tell you about it.

The Greenlee Pusher will take pipe up to 4-inch and has 6 operating speeds. Pumping the handles sets up pressure within the cylinders, causing the unit to move forward on the steel base. These bases are made in lengths for pushing from 4 to 7 feet with but one setting of the pipe clamp.

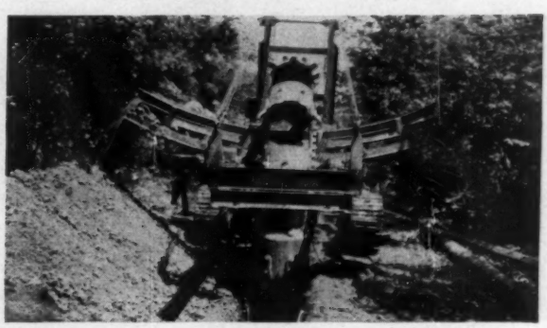
Below: Set up for pushing under a paved street on a National Highway.

GREENLEE TOOL CO., 1700 Columbia Ave., ROCKFORD, ILLINOIS

CLEVELANDS

Set a Fast Pace for the Pipeline Jobs . . .

Left
BABY DIGGER
Model 95



Right
CLEVELAND
Model 110

With them you get { MOST COMPLETED TRENCH FOOTAGE AND MOST ACTUAL WORKING HOURS } *per shift*

If you would meet and beat estimates on your trenching jobs you must have machines that will deliver the maximum footage, under all soil conditions, and do the work with a minimum of delays and at lowest operating costs. The Cleveland Baby Digger Model 95 and the Cleveland Model 110 enable you to accomplish just these results.

Compact, fast, tough, powerful, and with all dead weight eliminated, they answer completely your requirements. Correctly designed and ruggedly constructed machines, they have the built-in qualifications to handle the gruelling main line work; extremely compact, flexible and easy to move around on the job, they afford maximum machine-usage in the crowded conditions of cities and towns.

By unstintingly spending money on constructions "Cleveland" enables you to save time and money on every job.

Write today for complete information.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 St. Clair Ave. Cleveland, Ohio

Easily transported on their own specially built trailers, at truck speed, Clevelands make machine trenching available on more jobs.

E.W.Wakelee Succeeds T.N.McCarter As President of N. J. Company

THOMAS N. McCARTER, president of the Public Service Corp. of N. J. since the forming of the company 36 years ago, recently announced his resignation, and Edmund W. Wakelee of Demarest, N. J., has been elected to succeed him as president.

Mr. McCarter was named chairman of the board of directors, which position was created on his recommendation at the last meeting of the board. He has served as director of the American Gas Association, and is the donor of the McCarter medals for life saving by the Schafer prone pressure method of resuscitation.

Mr. Wakelee had been vice-president in charge of law since 1923, and had been connected with the corporation and its subsidiaries since 1917.

Percy S. Young of Montclair, formerly vice-president in charge of finance, was named chairman of the executive committee, also a new office.

Thomas N. McCarter Jr., was appointed vice-president of the Southern division. He succeeded Brig. Gen. Edward C. Rose of Trenton, who was transferred to the home office in Newark as a vice-president.

Robert A. Zachary of South Orange, assistant vice-president in charge of public relations, was appointed vice-president at the Newark home office.

William B. Hartshorne of Short Hills, who held the office of assistant to Mr. McCarter, was made assistant to the chairman of the board, Mr. McCarter's new post.

The corporation announced Mr. McCarter would remain senior executive officer with plenary powers of supervision and direction. Mr. Young was re-elected as a director with Mr. McCarter and Mr. Wakelee.

■ ■

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Petroleum and Gas Engineer
Design—Construction—Reports
■
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1936-42 5th Avenue, Pittsburgh, Pa.

YOUR HEATER PLANS
For Fall

Homestead Woodfire—Oak No. 03

Should include some provision for the profitable Gas Fireplace business to be had in your community. People buying new Gas units for their fireplace want something better and different from the ordinary gas heater.

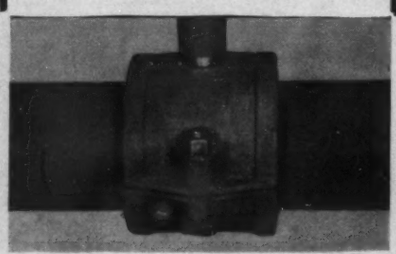
There is *profit* and *prestige* in displaying and selling:

HOMESTEAD "WOODFIRES"
and
HOMESTEAD "COALFIRES"

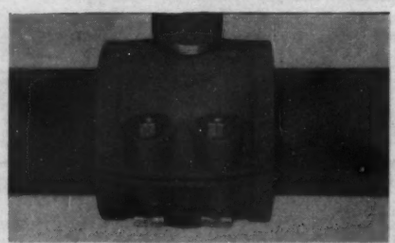
"The Truly Appropriate Fireplace Heaters"

Homestead Heater Co., Inc.
SELVAGE STREET NEWARK, NEW JERSEY
Send for Catalog Today

"ACIPCO" SPLIT SERVICE SLEEVES
For maximum speed and economy in reinforcement at service connections, especially where large taps are made, keep a supply of these popular "Acipco" Split Service Sleeves always on hand!



2-bolt type for use where tap does not exceed 2" in diameter.
4-bolt type for use where tap does not exceed 3" in diameter.



AMERICAN CAST IRON PIPE CO.
BIRMINGHAM, ALA.
Dallas Houston El Paso Pittsburgh Chicago
Kansas City Minneapolis New York City
Cleveland Los Angeles San Francisco

Personnel Changes Made By Equitable Gas Co.

JOSEPH McKinley, vice-president in charge of sales, Equitable Gas Co., Pittsburgh, Pa., has announced the reorganization of Sales and Service and the Equitable Sales Co. to provide separate and independent sales activities for the Duquesne Light Co. and the Allegheny County Steam Heating Co. on the one hand, and the Equitable Gas and Pittsburgh and West Virginia Gas Co.'s on the other. These companies are subsidiaries of the Philadelphia Co., Pittsburgh, Pa. Personnel changes for the gas companies were announced as follows:

F. B. Jones was appointed general sales manager of the Equitable Gas Co. and Pittsburgh and West Virginia Gas Co., Grafton, W. Va.; V. L. Black, manager of the residential sales department; Raymond R. Little, manager of the commercial sales department and utilization engineer; William S. Redpath, manager of the sales promotion department; John P. Brosius, manager of the industrial gas sales department; John F. Rafferty, budget supervisor.

■ ■

Progress Report is Feature of April S.C.M.A. Meeting

The regular April meeting of the Southern California Meter Association was held Thursday the 27th at the Van Matre Inn, Huntington Park, Calif. Harry Faull, president of the Association, presided.

Technical part of the meeting was devoted to a progress report on the activities of the joint C.N.G.A., P.C.G.A., and S.C.M.A. committee engaged in the work of simplifying coefficient determinations. The report, presented with illustrative slides, was made by a past S.C.M.A. president, C. B. Heartwell, who represented the C.N.G.A. on the joint committee.

The entertainment and educational activities of the evening were furnished by A. B. Stiverson, chief yeoman of the Los Angeles Navy Recruiting office. These consisted of sound motion pictures showing some of the activities of the Navy personnel.

■ ■

New York Corp. to Expand

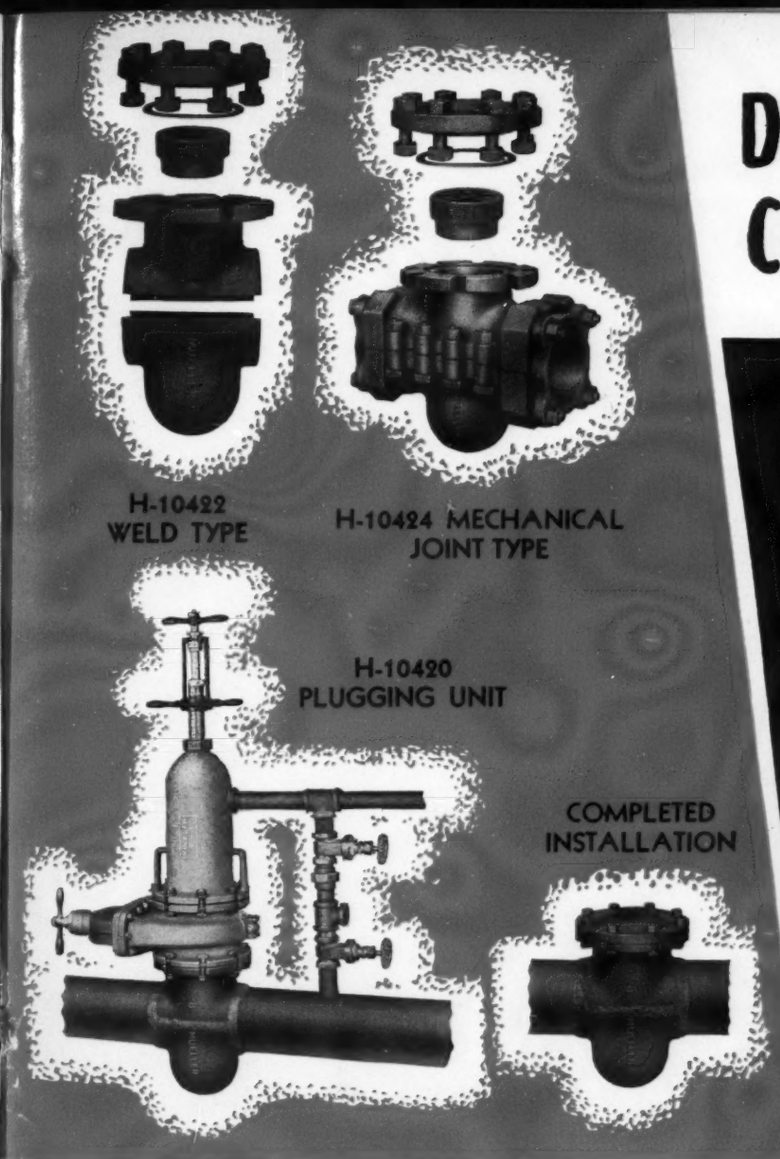
Approximately $25,000,000 will be spent during 1939 by the Niagara Hudson Power Corp., New York City, and subsidiaries, to extend and improve service to gas and electric customers in New York State, it was announced by Alfred H. Schoellkopf, president of the corporation. This is $10,000,000 more than was spent for such purposes in 1938.

■ ■

Hargrave Joins Mueller Co.

George H. Hargrave, sales supervisor of the Dallas (Texas) Gas Co., resigned April 1 to become sales representative for the L. J. Mueller Furnace Co. in Texas, Oklahoma and Louisiana.

DO THE TOUGH ONES COME YOUR WAY?

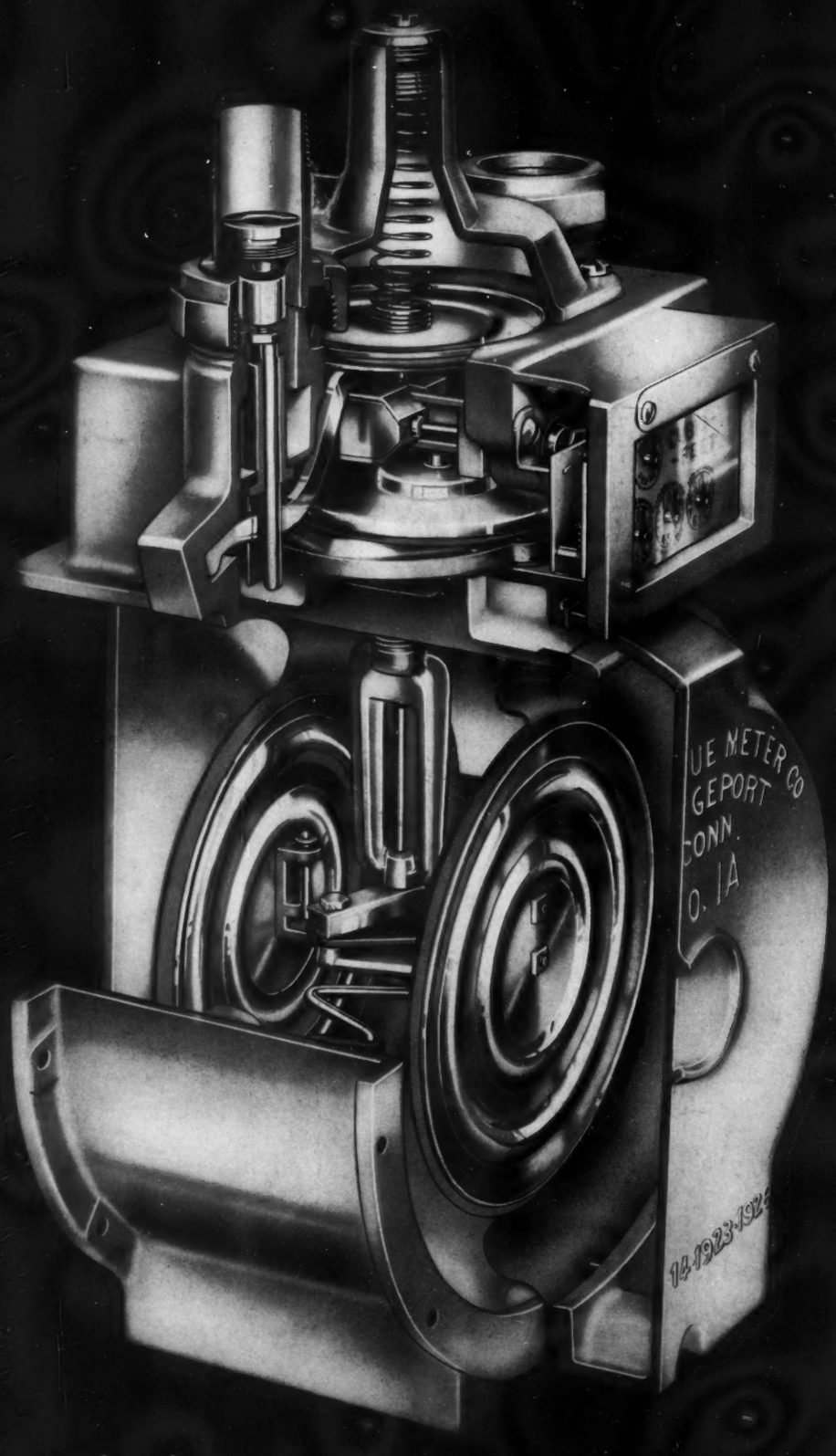


If you are ever faced with difficult installation or maintenance problems, you'll find you have a definite need for Mueller Pressure Control Fittings and Equipment. They may be used for removal or replacement of pipe, for extending dead-end lines, making lateral connections and all kinds of repair work without ANY LOSS OF GAS or WITHOUT INTERRUPTION OF SERVICE. The fittings are quickly and easily installed and at less cost than any type of valve.

Mueller Pressure Control Fittings need not be installed until the occasion arises and then they are installed at the exact location desired. There is no looking for the nearest shut-off valve as the gas is merely re-directed around the section under repair. There is a positive shut-off, the work goes on with absolute safety and consumer service continues without even a loss of pressure. Get the whole story on how to make these definite savings. Write us today for complete information.

MUELLER CO. DECATUR ILL.

Sprague Leads Again



Here it is!!

The latest achievement in Gas Measurement and Control . . . a combination Meter and Regulator. Write for particulars.

THE SPRAGUE METER CO., BRIDGEPORT, CONN.